4.5 Hazard Area 5 – Water Canon de Valle Watershed

The Water/Canon de Valle watershed heads on the flanks of the Sierra de Los Valles and drains a total area of about 10 mi^2. It originates on US Forest Service lands and extends across the southern portion of the LANL all the way to its confluence with the Rio Grande in White Rock Canyon.

On a regional scale, the Water/Canon de Valle watershed is an interrupted stream attributable to several perennial springs in the upper and middle reaches. These springs support perennial reaches followed by intermittent reaches limited to the area west of the LANL boundary and state road NM 501.

This drainage passes near numerous sites that have been used for testing and development of weapons components. While several of these sites have been inactive since the early 1950s, others have remained in use to the present. Potential contaminant releases into the drainage as a result of these operations include HE, radionuclides, and metals.

Currently, hiking trails provide recreational access to the portion of the drainage west of the LANL boundary on Forest Service land. Local residents and LANL employees use this area for activities such as hiking, biking, jogging, and camping.

Frequently, anthropogenic flow occurs in a canyon reach that extends from near the southwest corner of the LANL boundary to a point slightly downstream of the confluence with its tributary, Cañon de Valle. This water is spring water that is piped to LANL facilities where it was once used for industrial supply. When released this water flows through stormwater drainages back into the watershed drainage.

4.5.1 Current State

Figure 4.5a1 shows the sources of airborne contamination in the Water/Canon de Valle watershed under current conditions, and the associated conceptual site exposure model. Existing operational sources of airborne contamination include open-air firing sites, open-air burn sites, and exhaust emissions. All are permitted and monitored to ensure compliance with applicable worker safety and environmental regulations, which account for the pathway controls in the conceptual site exposure model.

Figure 4.5a2 shows the current sources of surface contamination in the Water/Canon de Valle watershed, including many liquid outfalls associated with ongoing operations, and many potential release sites. One potential surface release site is MDA S, which in this way is unlike most other MDAs. MDA S is a fenced, active experimental plot measuring approximately 10 ft by 10 ft (3 m by 3 m). The depth to groundwater below MDA S is approximately 1160 ft (348 m). The area is used to study the effect of soil and weather on the decomposition of explosives. The area, which slopes to the southwest, is well vegetated with grasses and weeds, locust shrubs, and two small ponderosa pines. Experiments to determine the persistence of explosives in soil were initiated in March 1965. Some experiments are still active, having less than 80 g (0.18 lb.) of HE in their inventory.

Operations contributing to the surface contamination in the Water/Canyon de Valle watershed are related to the production of HE and include casting, pressing, and machining of HE; assembly of explosive test devices; fabrication of plastic components; development of new materials; and nondestructive examination. These operations have been conducted since the early 1940s and has recently had a high-pressure tritium facility installed. As indicated in the conceptual site exposure model accompanying the map of surface releases, both institutional and natural controls reduce the potential for harmful exposures to surface contamination.

The existing subsurface sources of contamination in the Water/Canon de Valle watershed shown in Figure 4.5a3 include several relatively small MDAs, just visible in the prescribed mapping format.

MDA N

MDA N is a pit containing the remnants of several structures and rubble from a firing site that had been exposed to either explosives or chemical contamination including mercury, thorium, and photographic solutions. The depth to groundwater beneath MDA N is approximately 1170 ft (351 m). MDA N was opened in 1962 and closed before 1965. The pit is covered with native backfill and vegetated.

MDA R

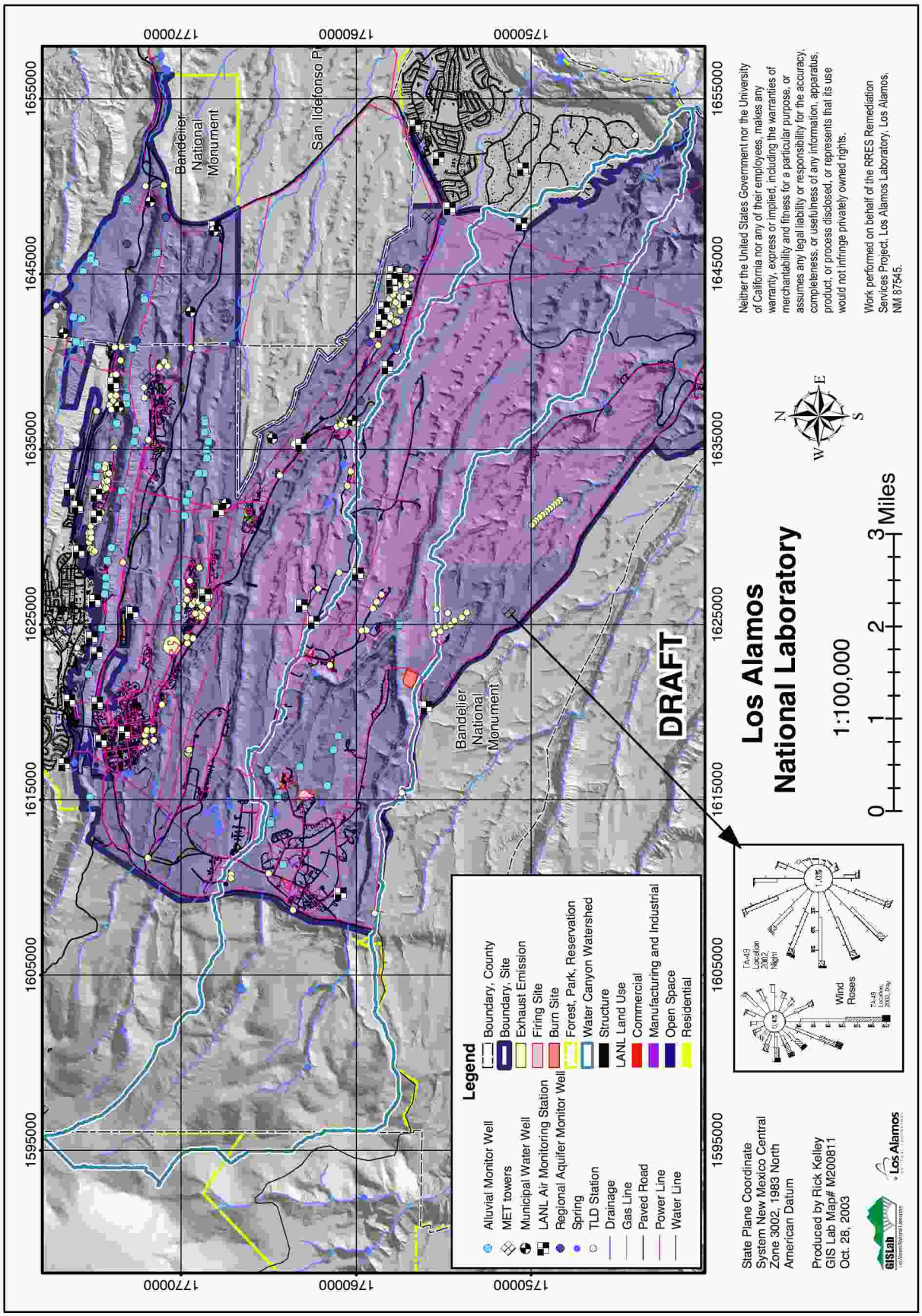

Figure 4.5a1. Hazard Area 5: Water Canyon Watershed, Hazard Category A: airborne releases, Current state.

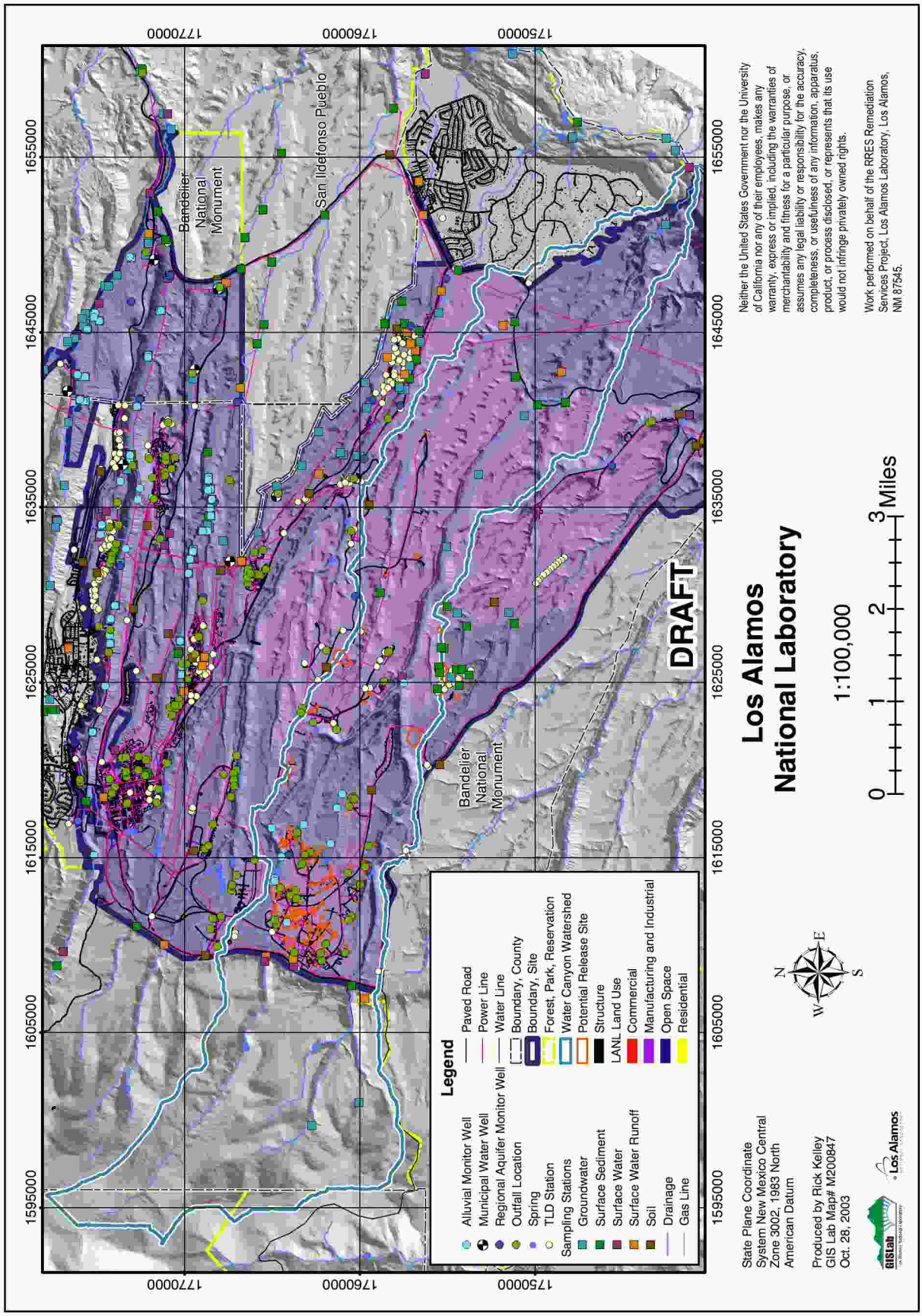

Figure 4.5a2. Hazard Area 5: Water Canyon Watershed, Hazard Category B: surface releases, Current state.

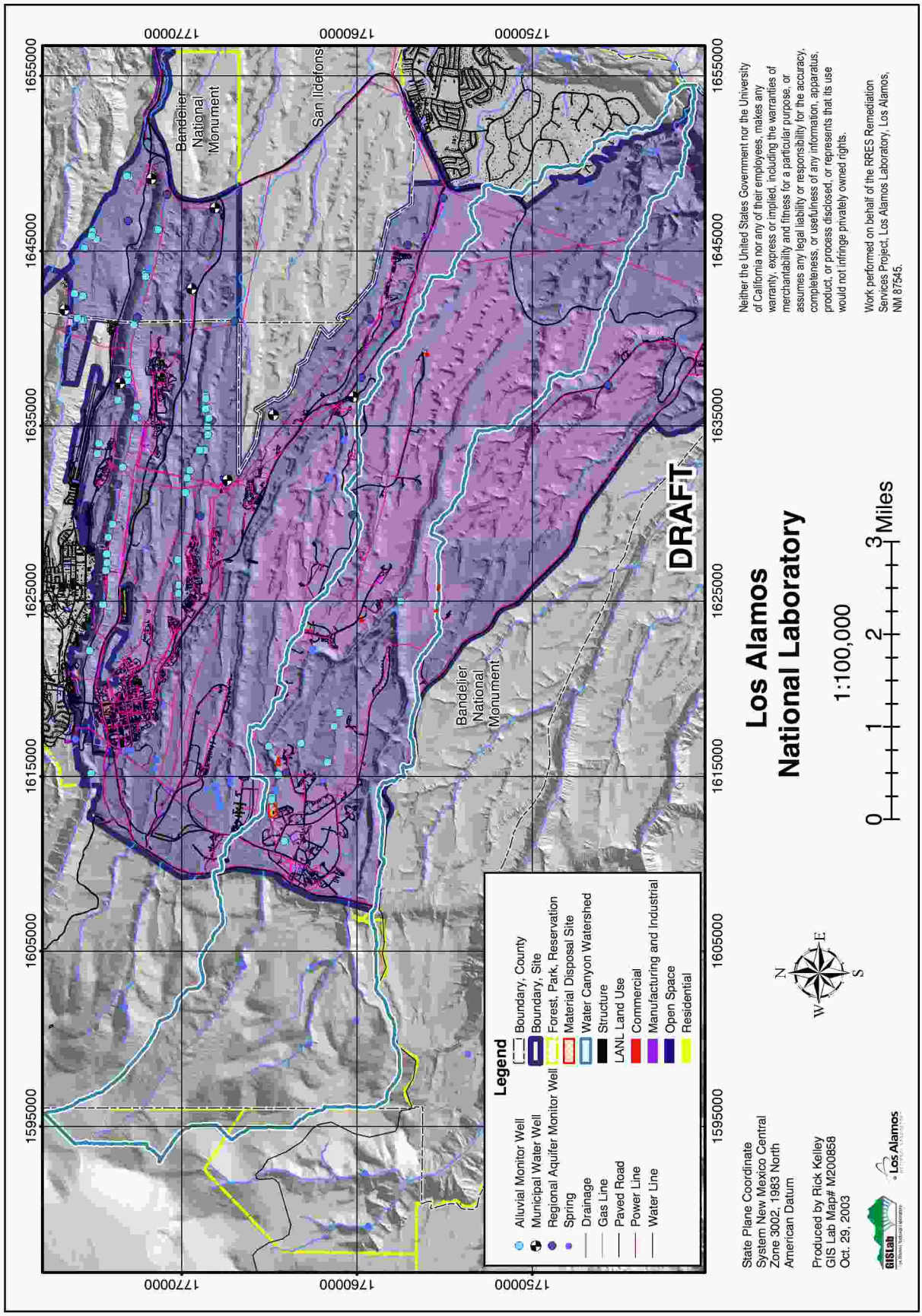

Figure 4.5a3. Hazard Area 5: Water Canyon Watershed, Hazard Category C: subsurface releases, Current state.

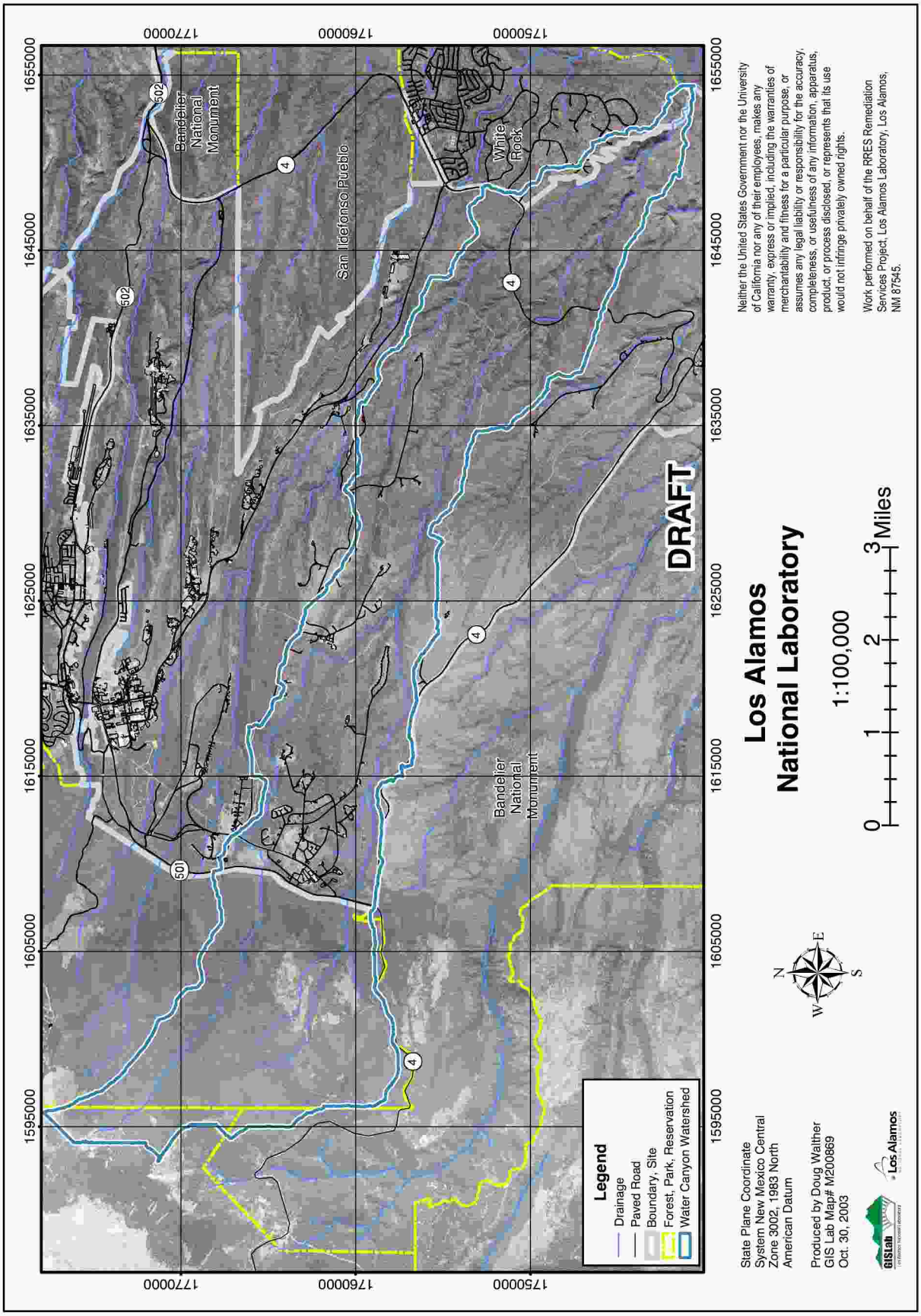

Figure 4.5a4. Hazard Area 5: Water Canyon Watershed orthophoto map.

MDA R is a historic HE burning ground and associated canyon side disposal area covering 11.5-acre (4.6-ha). The depth to groundwater beneath MDA R is approximately 1240 ft (372 m). MDA R was an active disposal unit from 1945 until 1951.Likely constituents at MDA R (based on analogy with the modern burning ground and MDA P) are HE, including chunk HE and barium. There are significant amounts of debris along the north side of MDA R. A geophysical survey at MDA R suggests that the depth of waste at MDA R is shallow.

MDA Z

MDA Z was used between 1965 and 1981 for the disposal of construction debris, including pieces of cement and rebar of various sizes, used concrete bags, steel blast mats from tests at PHERMEX, and other debris. Pieces of partially burned wood are visible. The landfill is roughly rectangular and measures approximately 200 ft by 50 ft (60 m by 15 m). Waste appears to have been placed in a naturally occurring depression; concrete filled sandbags are visible, which were probably piled as a retaining wall, and other debris was probably filled in behind it. One face grades to native soil, while the other is exposed and stands approximately 15 ft (4.5 m) high. Most of the debris on the exposed face is not covered with soil and is exposed to wind, rain, and snowmelt. Contaminants at the site include metals from wire, blast mats, VOCs and/or semivolatile organic compounds from charred wood, road and construction debris, and radioactive substances (e.g. from the blast mats). Chunks of uranium are visible at this site. The depth to groundwater below MDA Z is approximately 1200 ft (360 m).

MDA AA

MDA AA is a site containing up to four trenches dug in mid-1960s to burn and dispose debris and sand from the firing sites. The depth to groundwater below MDA AA is approximately 770 ft (231 m). The trenches provided safety and administrative controls for explosives and for materials possibly contaminated with explosives; they also reduced the volume of firing site debris. The last active trench on the south side of MDA AA was closed May 12, 1989 in accordance with New Mexico solid waste regulations. After the last trench was filled with burned debris and covered with clean soil, the entire MDA AA trench area was graded to lessen the potential of stormwater run-on and run-off that would erode the site and impact the Water Canyon watershed. Combustible firing site debris, such as wood, is still burned on the surface of a permitted burn area 100–300 ft (30–90 m) west of MDA. AA.

4.5.2 Risk-Based End State

Figures 4.5b1, 4.5b2, and 4.5b3 present maps for airborne, surface, and subsurface contamination in the Water/Canon de Valle watershed, consistent with the risk-based end state vision in 2035. Continued use of this watershed for NNSA mission-critical experimental operations is expected through 2035, as suggested by the similarity in the current- and risk-based end-state maps.

4.6 Hazard Area 6: Ancho Watershed

The Ancho watershed heads on the plateau within the Laboratory near the middle of the southern Laboratory boundary has a total drainage area of about 4.6 mi^2. It extends for about 7.3 mi across Laboratory land all the way to its confluence with the Rio Grande.

Ancho Canyon is ephemeral within the LANL boundary and on to the east past state road NM 4, to a point about 0.8 mi upstream from its confluence with the Rio Grande. At that point, a perennial spring, fed by the main aquifer supports a perennial flow all the way to the confluence with the Rio Grande. No significant snowmelt occurs in this drainage.

A portion of this watershed east of state road NM 4 is used considerably for hiking access to the Rio Grande.

4.6.1 Current State

Figures 4.6a1, 4.6a2, and 4.6a3 present maps and associated conceptual site exposure models for airborne, surface, and subsurface contamination (respectively) in the Ancho watershed under current conditions. The sources of airborne and surface contamination are similar to those in the Water/Canon

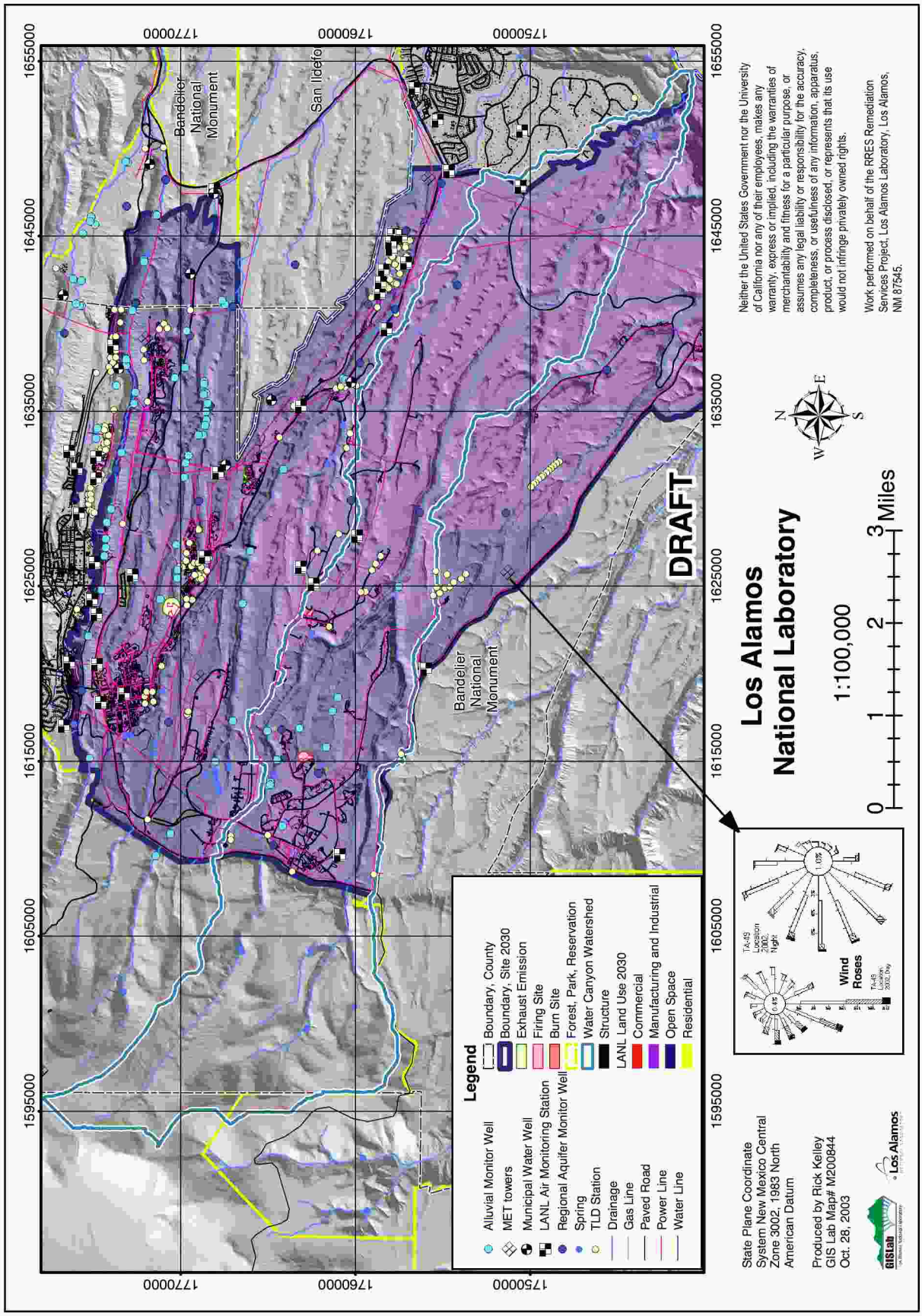

Figure 4.5b1. Hazard Area 5: Water Canyon Watershed, Hazard Category A: airborne releases, End state.

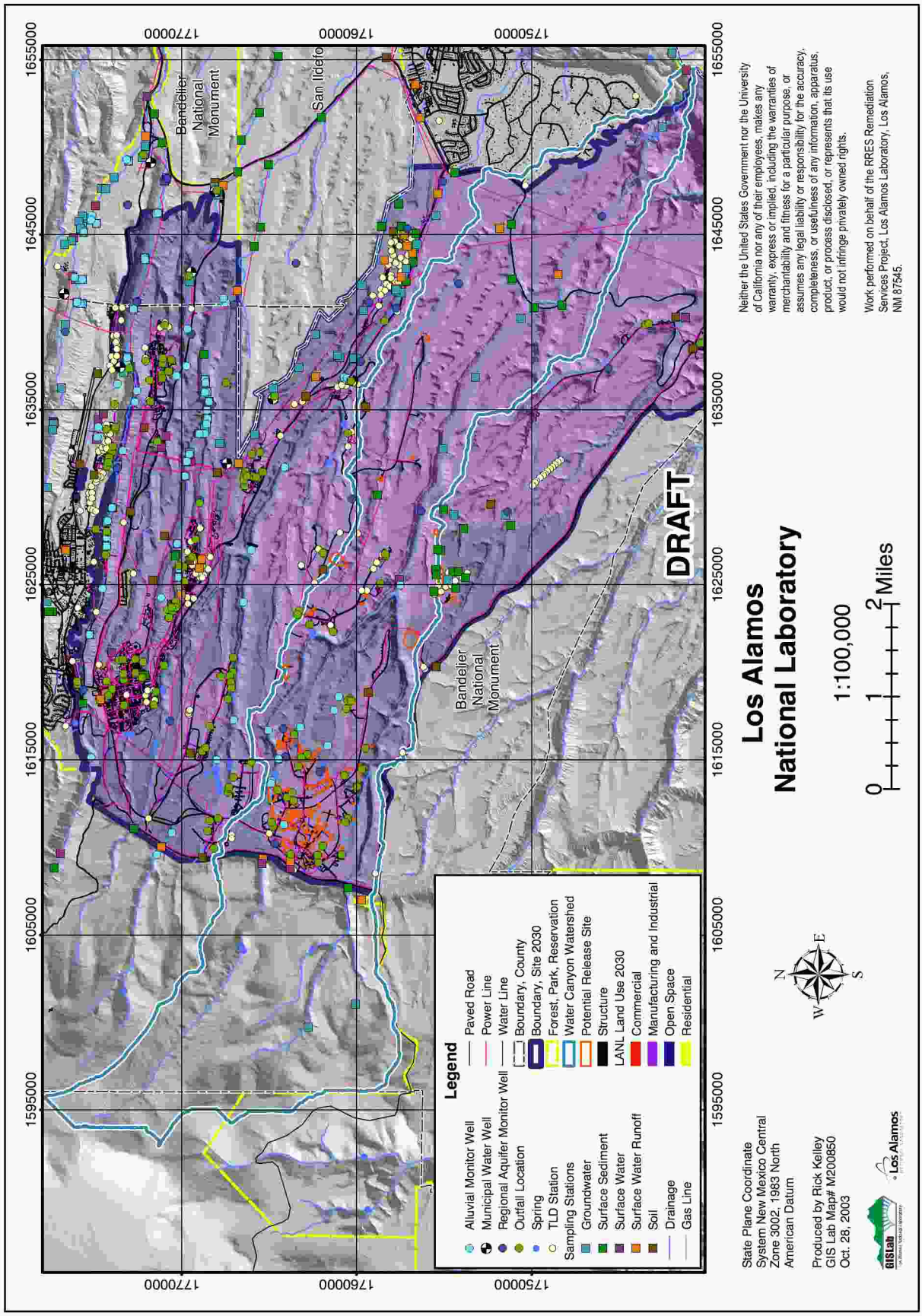

Figure 4.5b2. Hazard Area 5: Water Canyon Watershed, Hazard Category B: surface releases, End state.

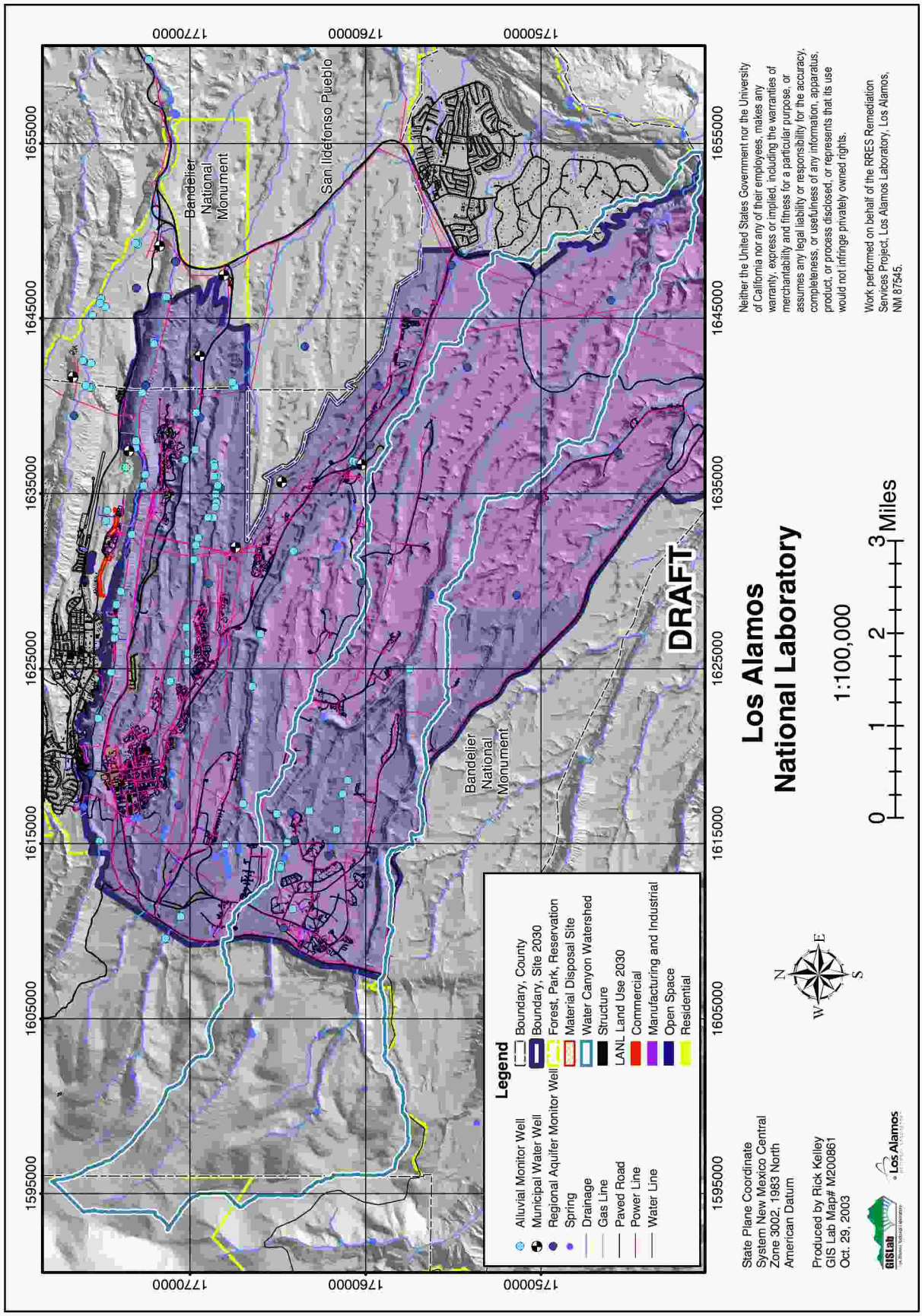

Figure 4.5b3. Hazard Area 5: Water Canyon Watershed, Hazard Category C: subsurface releases, End state.

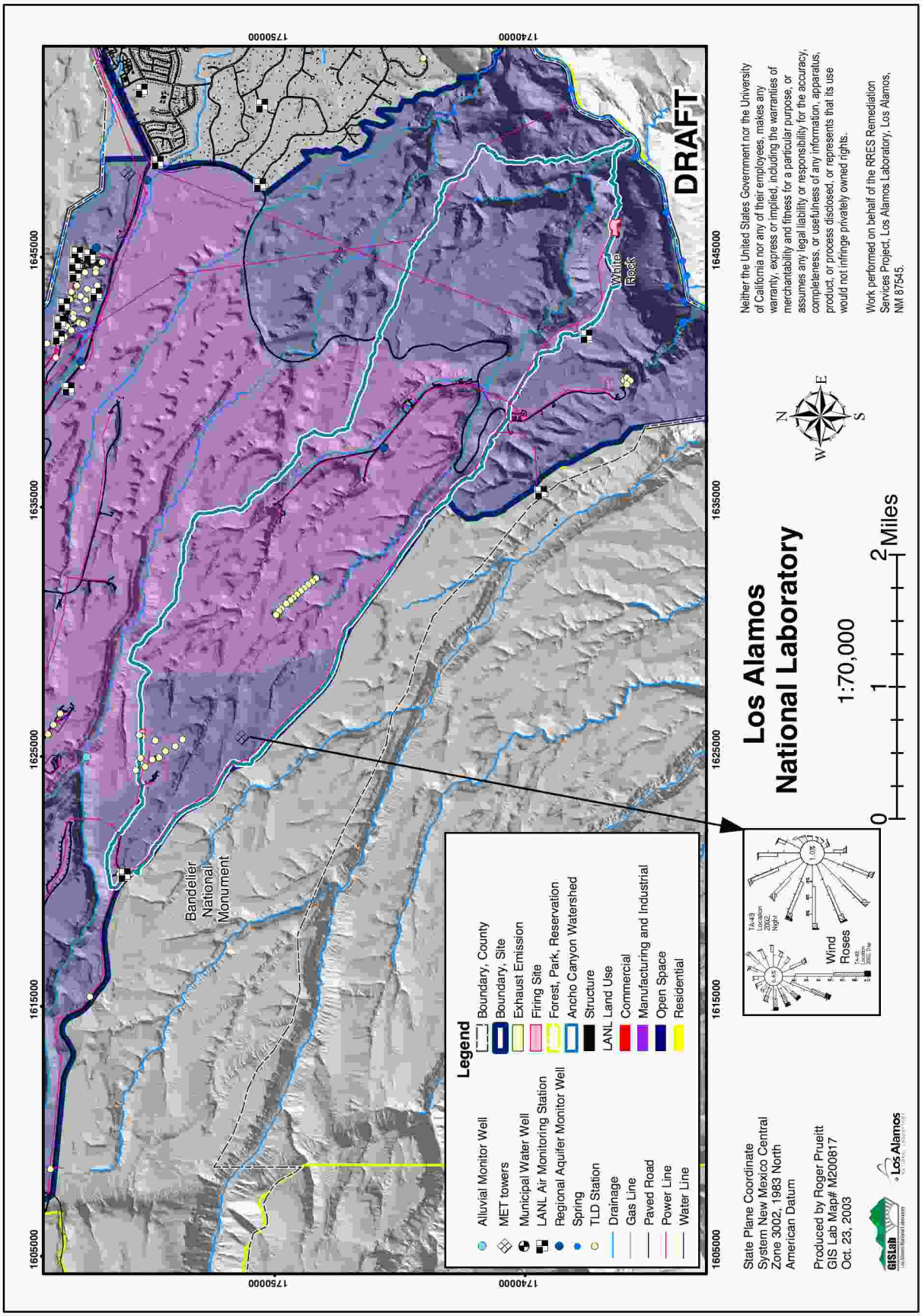

Figure 4.6a1. Hazard Area 4: Ancho Canyon Watershed, Hazard Category A: airborne releases, Current state.

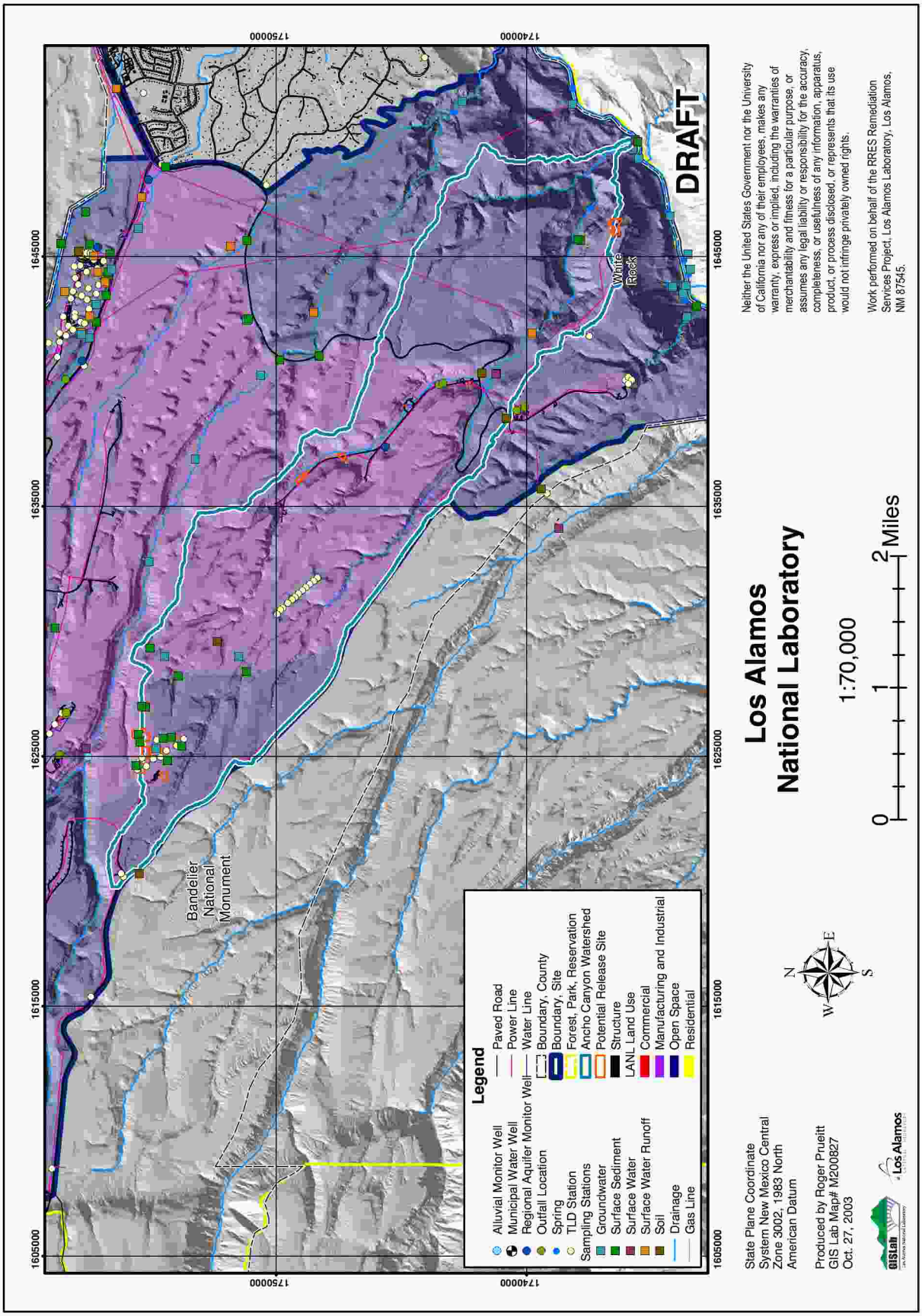

Figure 4.6a2. Hazard Area 6: Ancho Canyon Watershed, Hazard Category B: surface releases, Current state.

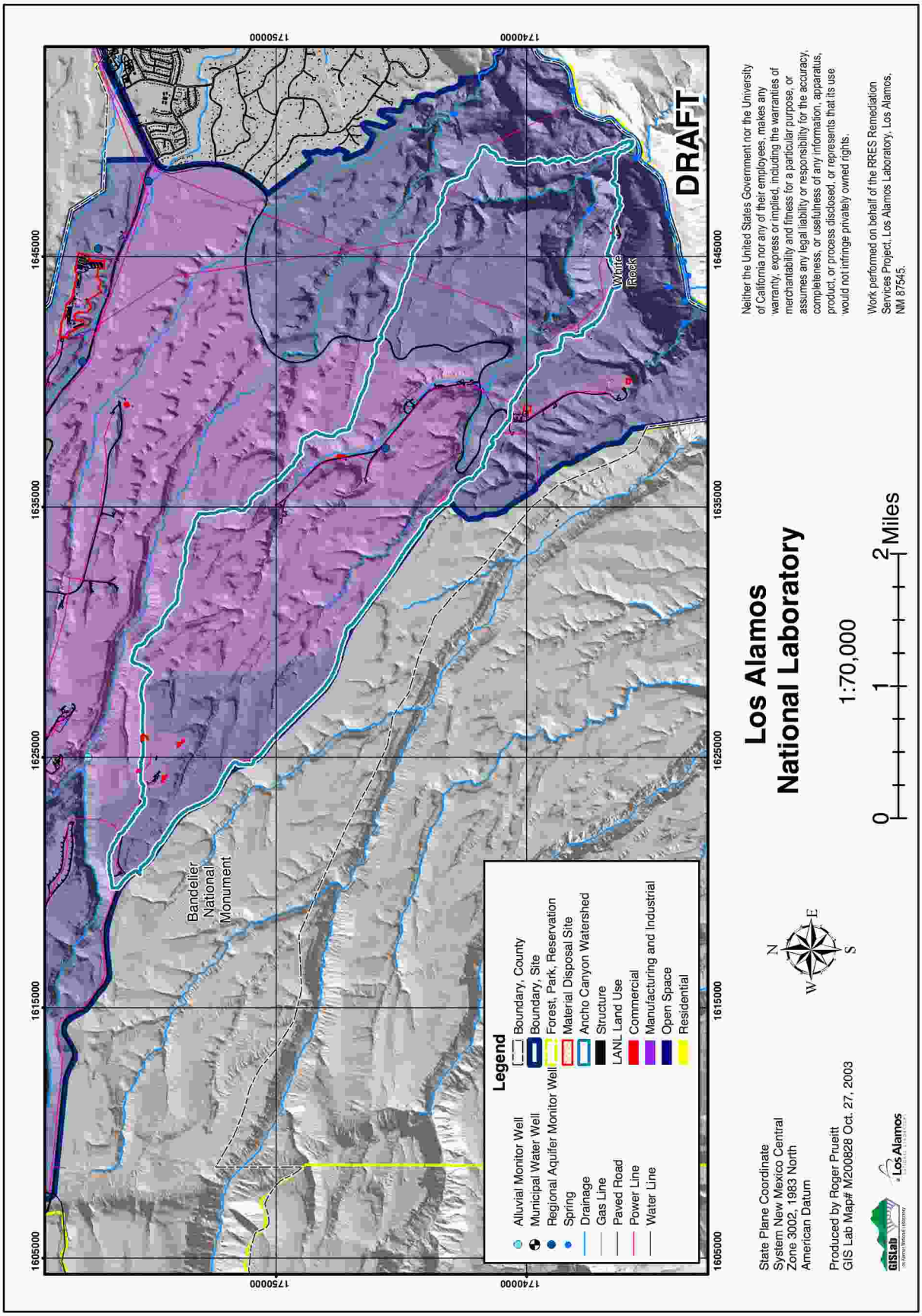

Figure 4.6a3. Hazard Area 6: Ancho Canyon Watershed, Hazard Category C: subsurface releases, Current state.

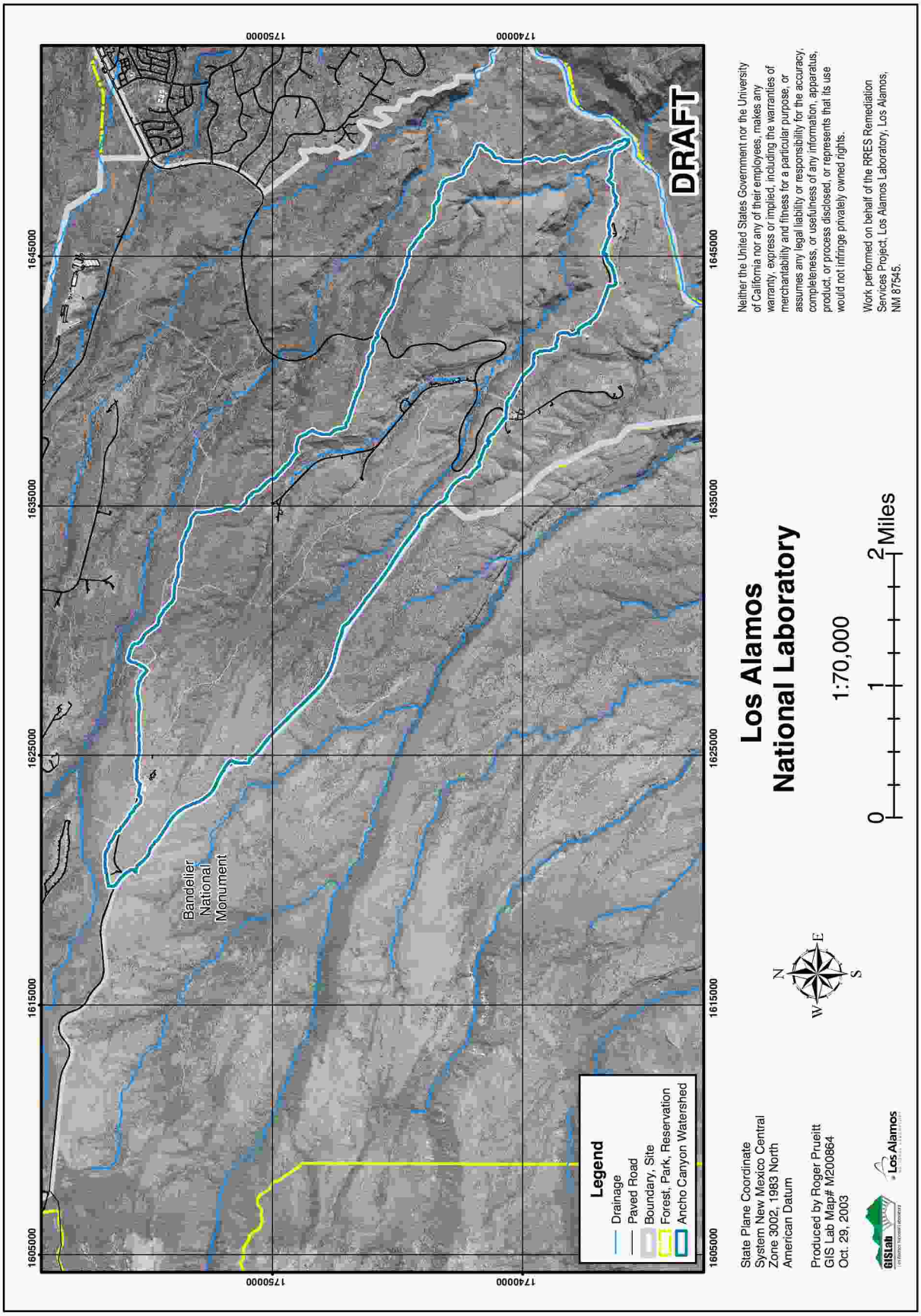

Figure 4.6a4. Hazard Area 6: Ancho Canyon Watershed orthophoto map.

de Valle watershed- largely production, experimentation, flashing, and disposal of explosives and explosives residues.

Referring to Figure 4.6a3, subsurface contamination in this watershed occurs in several subsurface MDAs. These are briefly discussed below, primarily to identify characteristics that provide some degree of exposure control, as identified in the conceptual site exposure model.

MDA D

MDA D is located at approximately 6500-ft (1950 m) elevation on a mesa. The depth to groundwater beneath MDA D is approximately 910 ft (273 m). MDA D consists of two underground chambers used to test explosive devices. The chambers were constructed in 1948 for initiator tests involving polonium-210, milligram quantities of beryllium, and large amounts of HE. One chamber was destroyed during testing. Debris from the detonation was ejected through the elevator shaft and spread over the mesa. A 10-ft-deep crater that formed around the chamber was later filled with the ejected debris and covered with uncontaminated soil.

MDA Y

MDA Y was one of several pits used for disposing of waste consisting primarily of debris from firing site experiments, empty chemical containers, and office waste. MDA Y was the first disposal pit at TA-39 and was used from 1973 until approximately 1976, when pit 2 was put in use. The depth to groundwater below MDA Y is approximately 590 ft (177 m).

MDA AB

MDA AB is located at an elevation on a high mesa within the Ancho Canyon watershed. The depth to groundwater below MDA AB is approximately 1120 ft (336 m). MDA AB was the location of the hydronuclear and related experiments performed from late 1959 to mid-1961. The experiments were conducted to assess safety of the storage and transportation of nuclear weapons components. The experiments were conducted in multiple shafts and chambers at depths between 60 ft and 80 ft (18 m to 24 m). The total volume of contaminated tuff has been estimated at about 1,000,000 ft^3 (30,000 m^3). The radiological inventory has been estimated as 0.2 Ci uranium-235 and 2,450 Ci plutonium-239, with some fission and activation products also likely to be present. Solid lead used as shielding as well as small amounts of beryllium are also contained in the experiment chambers. The experimental shafts were installed in four different areas in what are now, roughly, the corners of MDA AB. In 1961, the surface over the shafts in Area 2 was covered with a clay/gravel layer overlain with asphalt to stabilize residual surface contamination. This pavement was removed in 1999 as part of an interim measure (IM) of the RFI to protect the site from subsurface moisture that results from surface water ponding, run-on, and inhibited evapotranspiration. The IM was completed by installing a clean, crushed-tuff cap containing a wire-mesh layer to inhibit burrowing animals. It was covered with native grasses to promote transpiration of moisture and inhibit erosion, and gravel also to inhibit erosion.

4.6.2 Risk-Based End State

Figures 4.6b1, 4.6b2, and 4.6b3 present maps for airborne, surface, and subsurface contamination in the Water/Canon de Valle watershed, consistent with the risk-based end state vision in 2035. Continued use of this watershed for NNSA mission-critical experimental operations is expected through 2035, as suggested by the similarity in the current- and risk-based end-state maps. Surface contamination is expected to be removed as necessary to achieve risk-based levels consistent with the planned land use (either industrial or recreational). MDAs are expected to be capped and monitored to achieve risk-levels consistent with industrial use and transferred to NNSA.

4.7 Hazard Area 7: Chaquehui Watershed

The Chaquehui watershed heads on the plateau in the southeastern corner of the Laboratory has a drainage area of about 1.6 mi^2. It extends for about 3 mi, across LANL property and to its confluence with the Rio Grande.

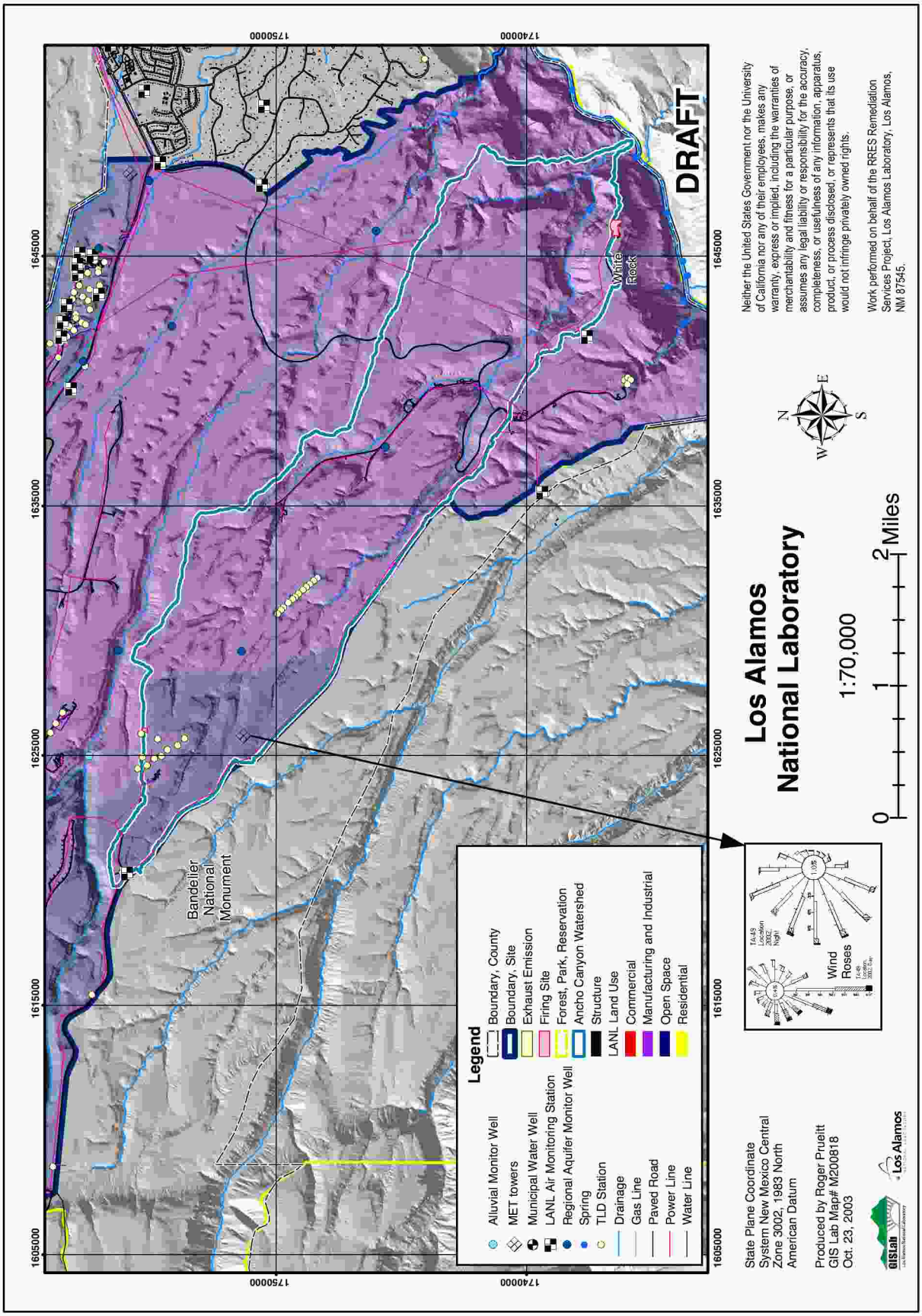

Figure 4.6b1. Hazard Area 6: Ancho Canyon Watershed, Hazard Category A: airborne releases, End state.

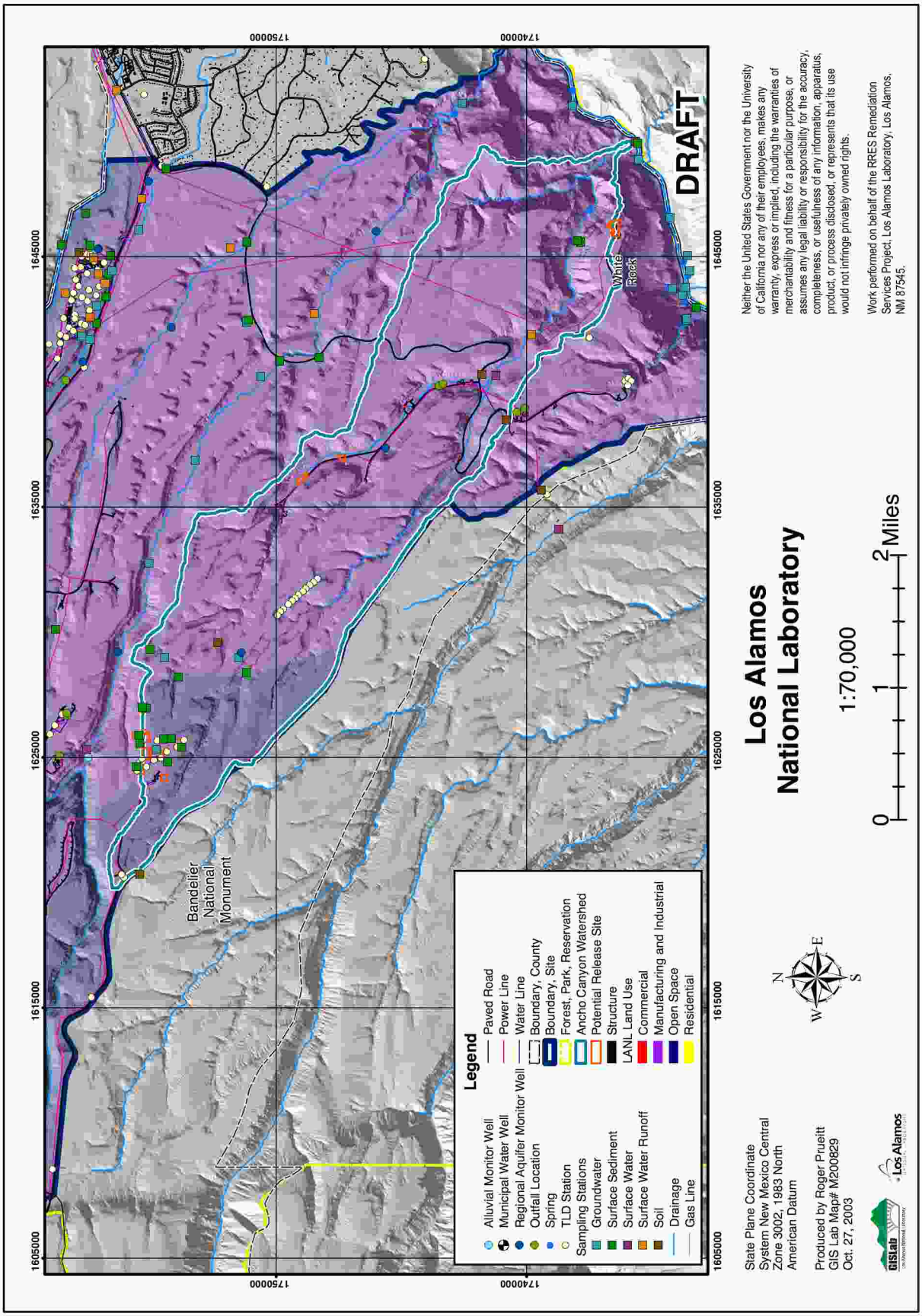

Figure 4.6b2. Hazard Area 6: Ancho Canyon Watershed, Hazard Category B: surface releases, End state.

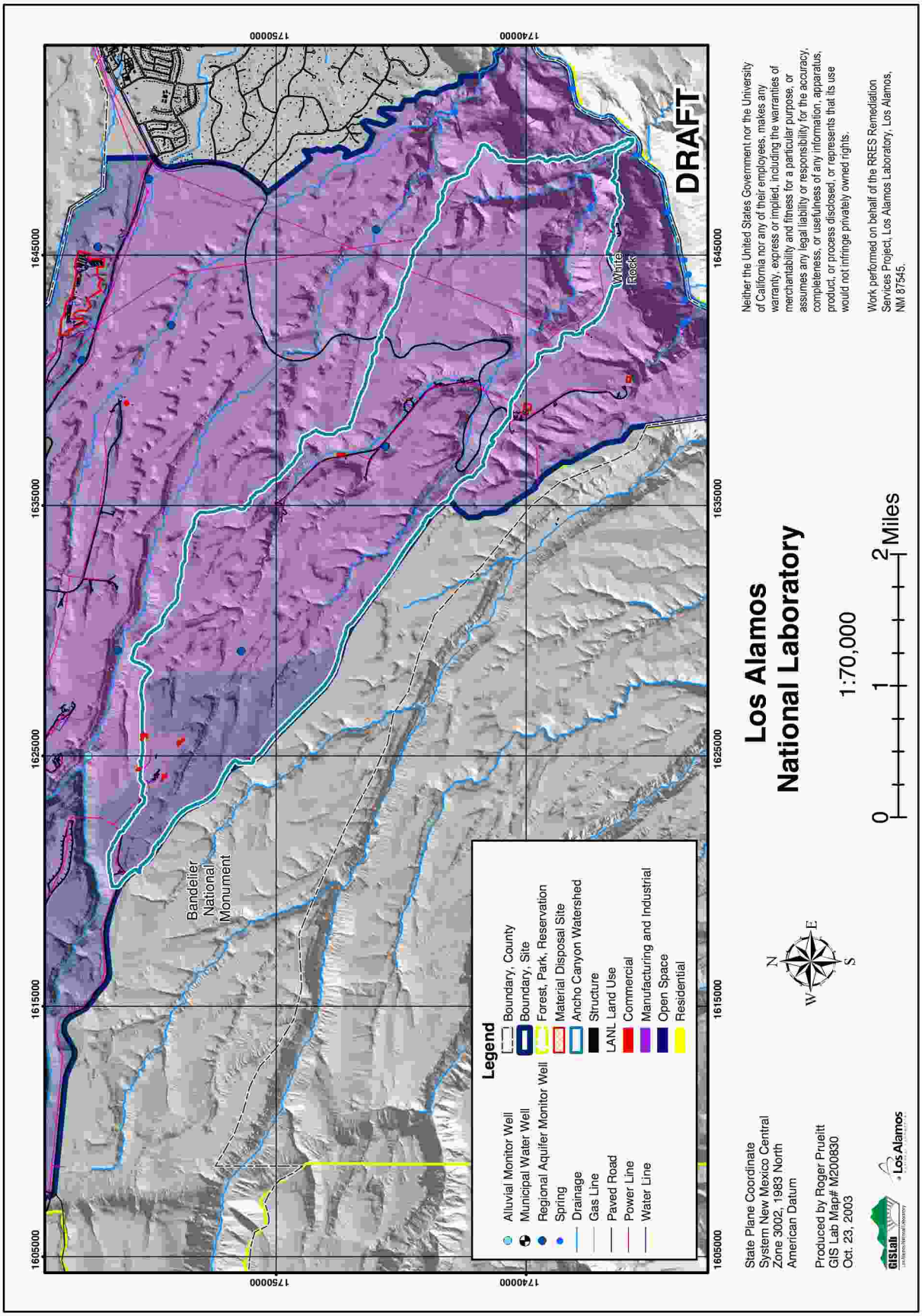

Figure 4.6b3. Hazard Area 6: Ancho Canyon Watershed, Hazard Category C: subsurface releases, End state.

Chaquehui Canyon is ephemeral all the way down to a point about 1/2 mi upstream from its confluence with the Rio Grande. At this point, a perennial spring, fed by the main aquifer, supports perennial flow for a short distance, followed by a short intermittent reach. About 1/4 mi upstream from the confluence with the Rio Grande, perennial spring water supports perennial flow that extends to the Rio Grande.

The sources of contamination in this watershed are firing sites. The US Forest Service previously owned the land.

Experiments involved testing of beryllium-containing initiators. Many experiments used uranium components. Polonium-210 was used as the radioactive source. With a half-life of 138 days, all polonium-210 has since decayed to undetectable levels.

A high-pressure tritium facility was operational at Main Site until late 1990.

The only LANL operations that discharge or drain directly into this watershed are the historical, inactive firing sites. Extremely low concentrations of tritium were detected during one sampling event in a spring in Chaquehui canyon; no other contamination issues are believed to exist.

4.7.1 Current State

Figures 4.7a1, 4.7a2, and 4.7a3 identify the airborne, surface and subsurface hazards. The only significant hazards in terms of inventory are associated with two relatively small MDAs.

MDA E

MDA E sits on mesa at approximately 6500-ft (1950 m) elevation. The depth to groundwater beneath MDA E is approximately 760 ft (228 m). MDA E operated between 1948 and 1955 for disposal of gun-type initiators and debris. Test material contaminated with polonium-210 was carried to the open pits. The first structure was underground chamber used for a single experiment in 1950. The explosive experiment in the chamber did not breach the surface. Beginning in 1951, a second site was used for gun-type and implosion studies, and for storage area and for burial of low-level radioactive contaminated equipment. Existing records indicate that the area contains several hundred kilograms of depleted uranium and some hazardous presence of hazardous waste

MDA K

MDA K is located on a mesa at an approximate elevation of 6500 ft (1950 m). The depth to groundwater beneath MDA K is approximately 820 ft (246 m). MDA K received liquid effluent from the high-pressure tritium facility that operated at from 1955 until 1990. This facility housed equipment used to transfer tritium from large tanks to smaller tanks that were transported to various LANL locations. After the tritium facility operations ceased in 1990, all equipment was removed from the building. The building and associated structures are scheduled for decontamination and decommissioning. MDA K contains a septic tank and drain field, sumps, a cooling water outfall, and a roof drain outfall.

4.7.2 Risk-Based End State

Figures 4.7b1, 4.7b2, and 4.7b3 identify the airborne, surface and subsurface hazards as they are expected under the conditions achieved by cleanup consistent with anticipated land use, which is generally industrial/recreational under LANL management.

4.8 Hazard Area 8: Frijoles Watershed

Frijoles watershed heads in the Sierra de los Valles on US Forest Service lands, and extends in a southeasterly direction across US Park Service land for about 14 mi to its confluence with the Rio Grande. The canyon remains on Bandelier National Monument grounds for most of its extent, and intersects LANL property for only a very short distance. Its drainage area is approximately 19 sq. mi.

A small perennial stream originates from springs and seeps in upper Frijoles canyon; two other springs produce surface flow that extends to the Rio Grande confluence.

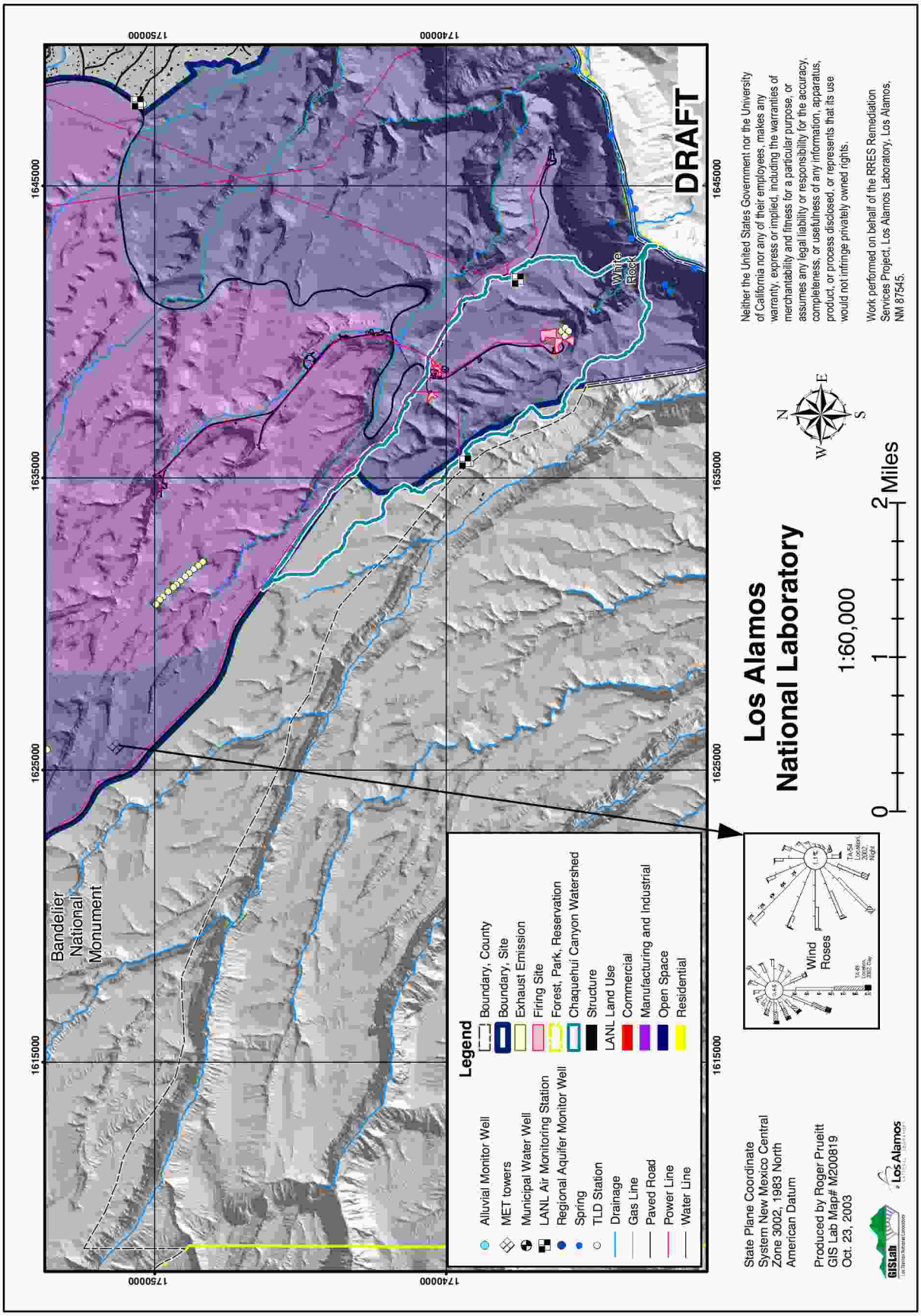

Figure 4.7a1. Hazard Area 7: Chaquehui Canyon Watershed, Hazard Category A: airborne releases, Current state.

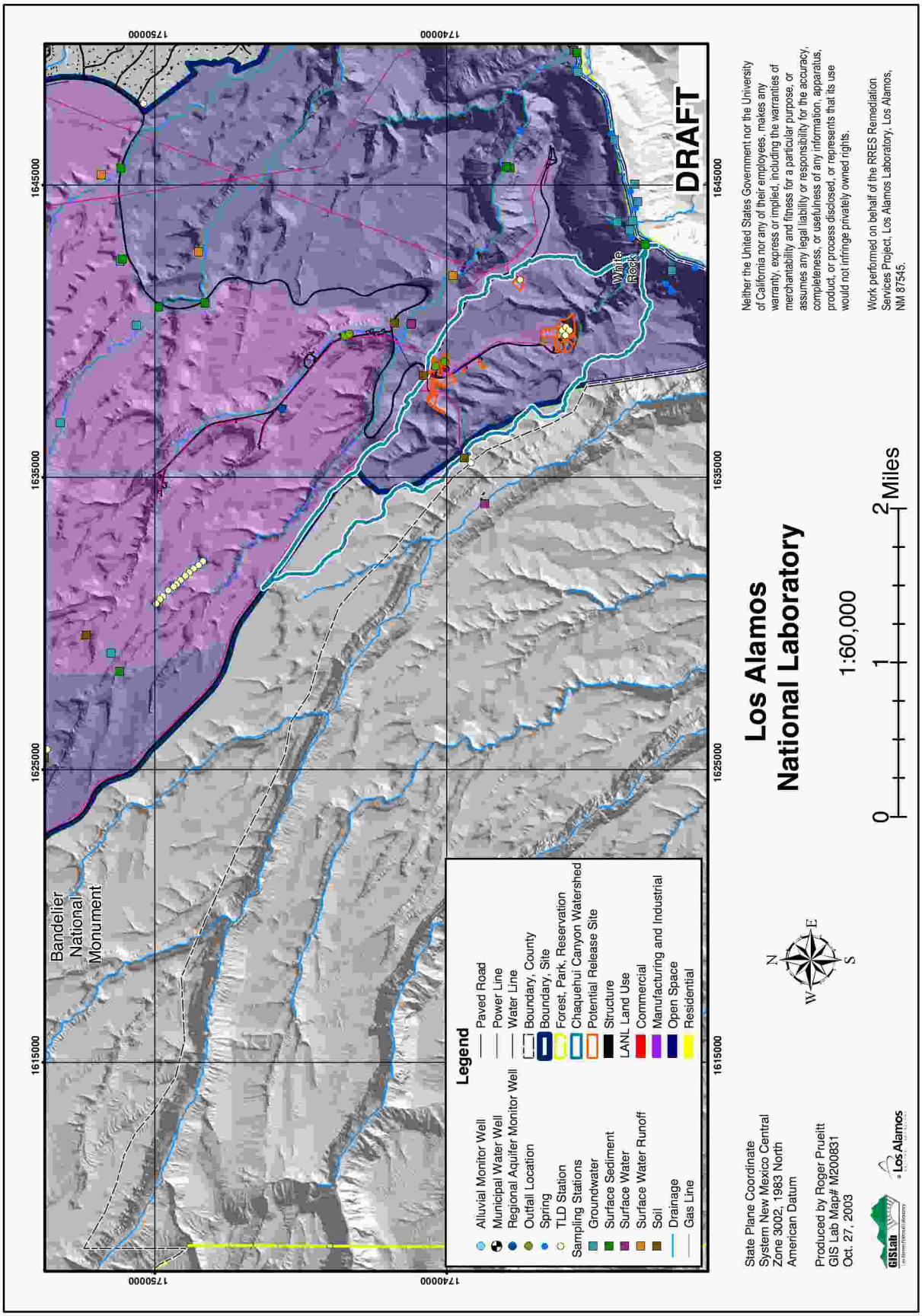

Figure 4.7a2. Hazard Area 7: Chaquehui Canyon Watershed, Hazard Category B: surface releases, Current state.

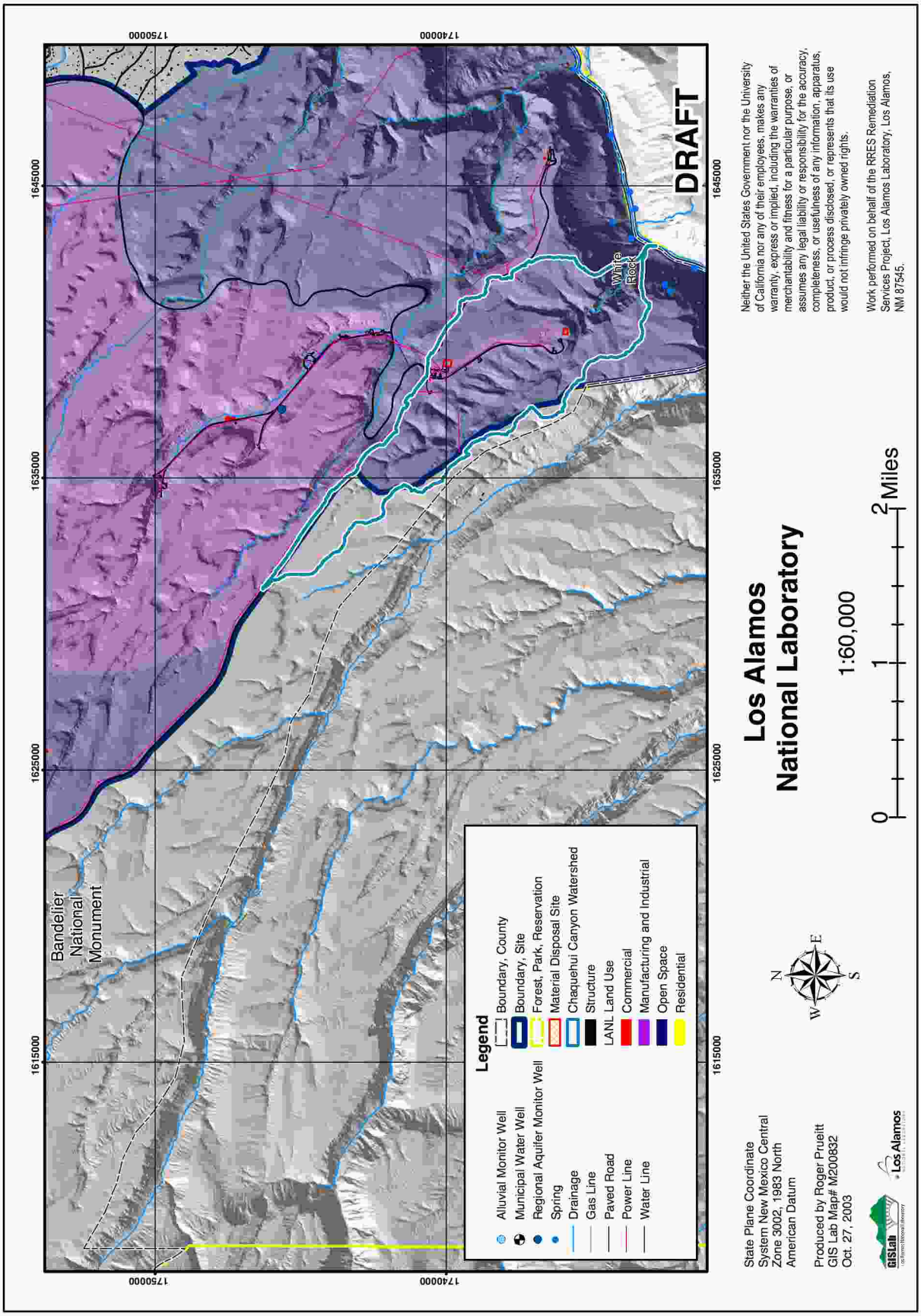

Figure 4.7a3. Hazard Area 7: Chaquehui Canyon Watershed, Hazard Category C: subsurface releases, Current state.

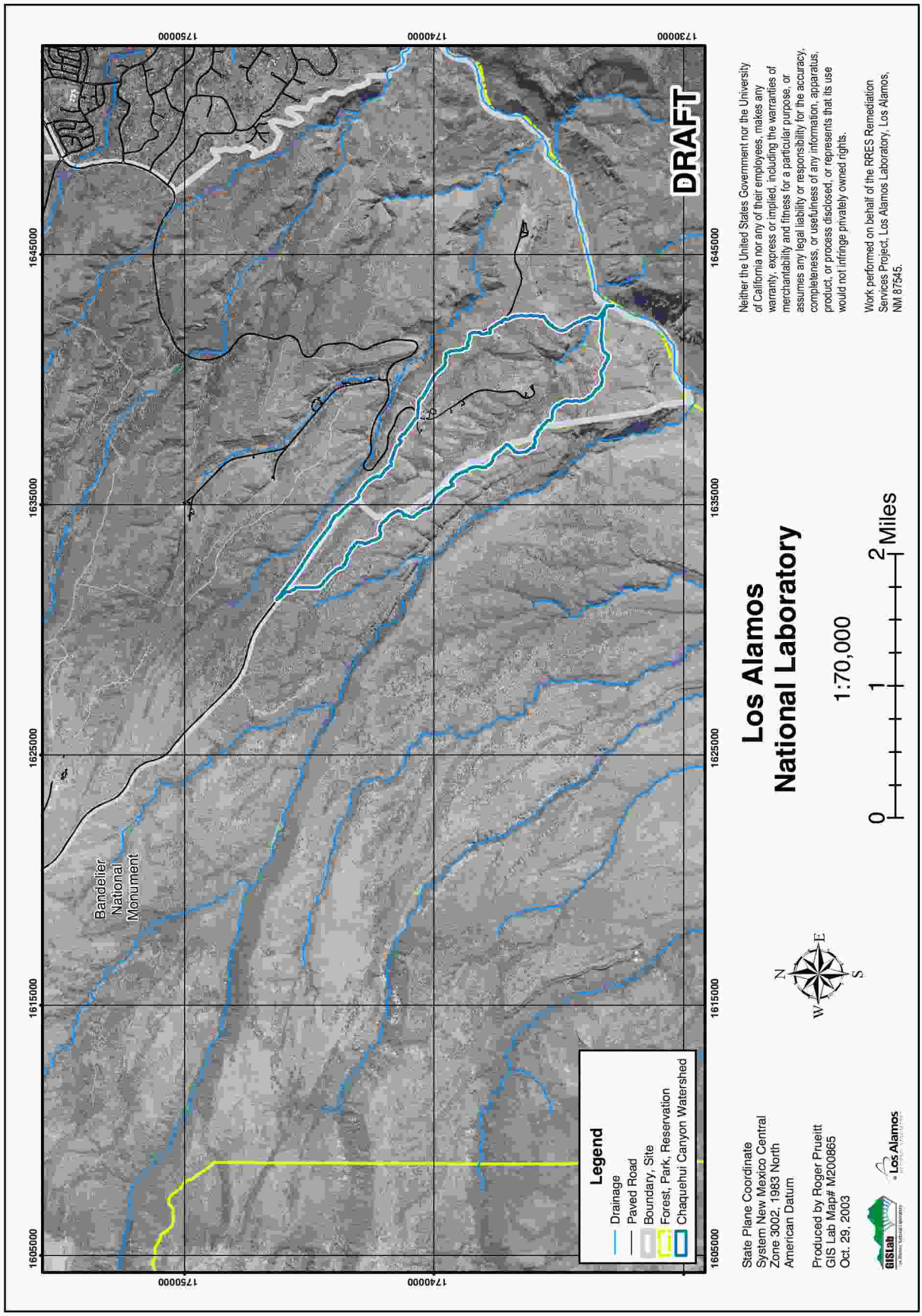

Figure 4.7a4. Hazard Area 7: Chaquehui Canyon Watershed orthophoto map.

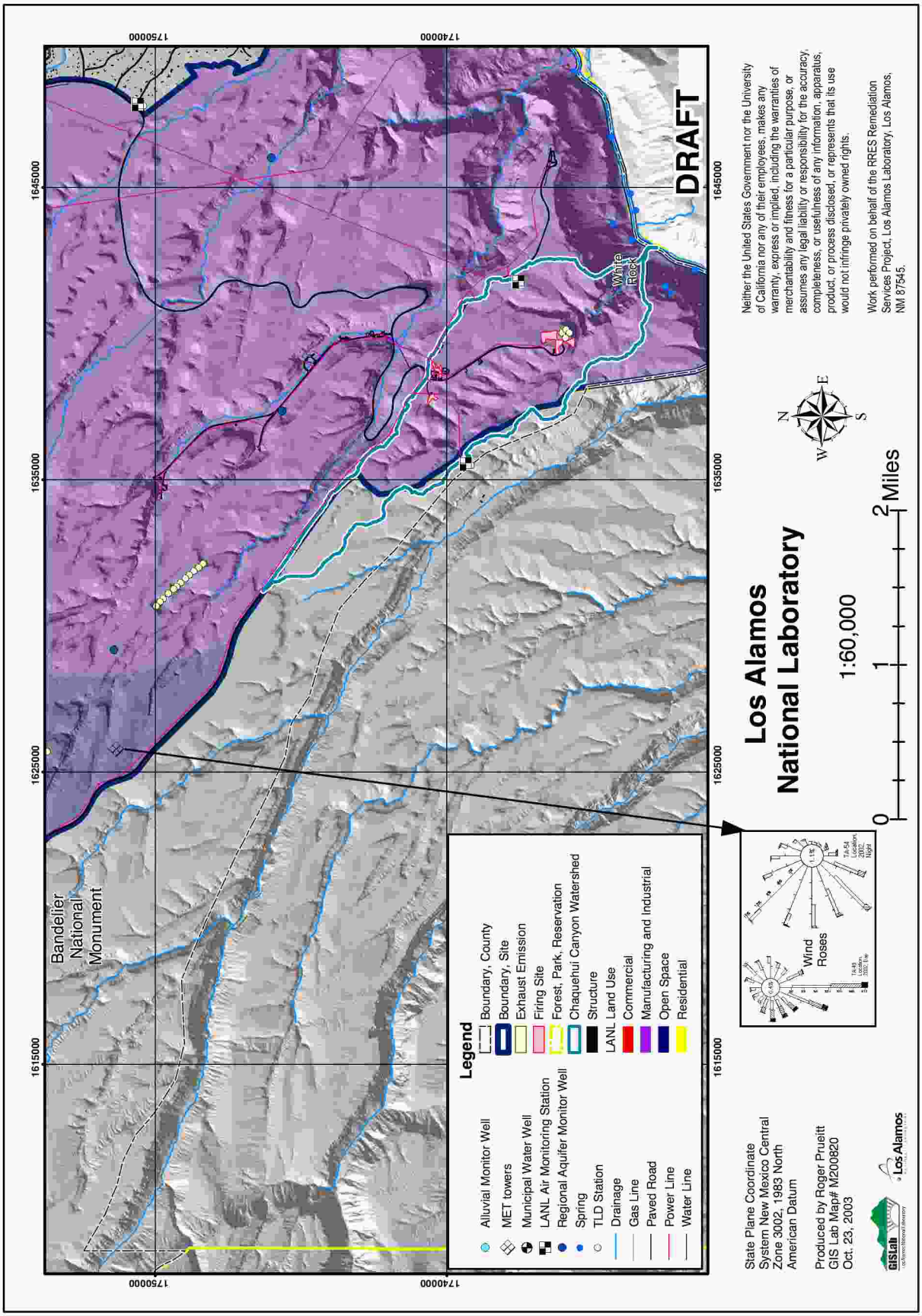

Figure 4.7b1. Hazard Area 7: Chaquehui Canyon Watershed, Hazard Category A: airborne releases, End state.

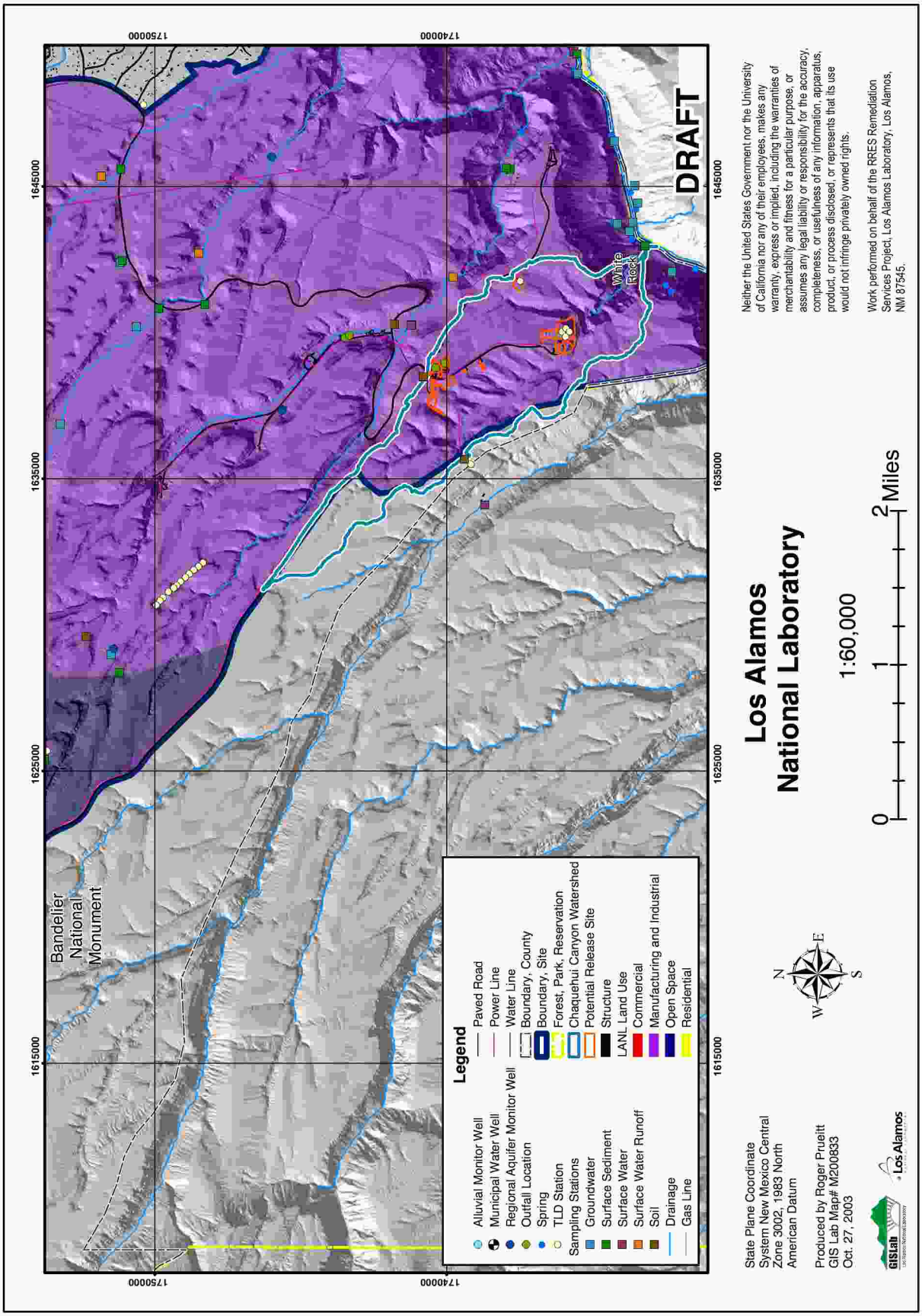

Figure 4.7b2. Hazard Area 7: Chaquehui Canyon Watershed, Hazard Category B: surface releases, End state.

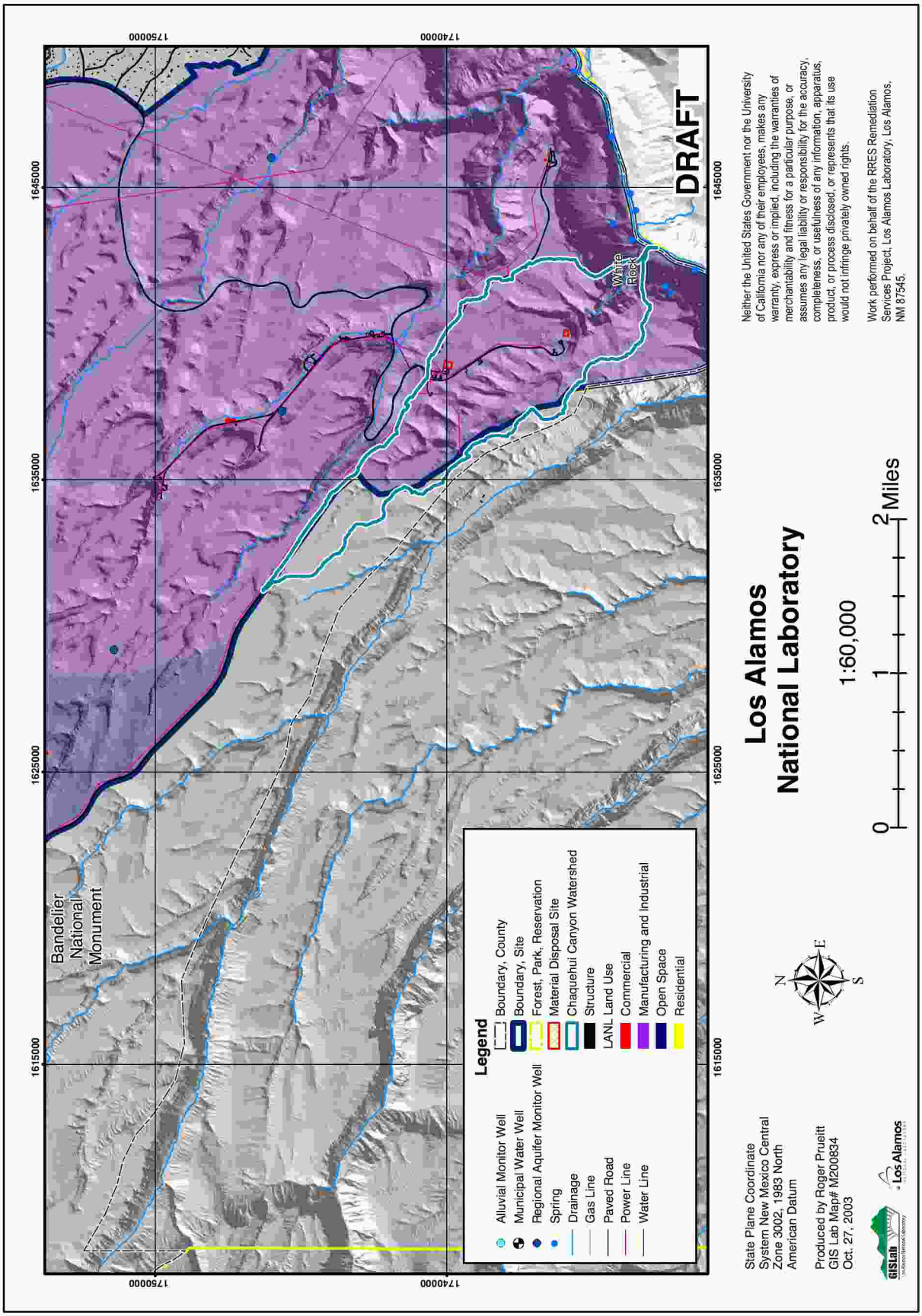

Figure 4.7b3. Hazard Area 7: Chaquehui Canyon Watershed, Hazard Category C: subsurface releases, End state.

No Laboratory operations have either historically or currently drain or discharge into the Frijoles watershed. It is of particular interest, however, because it crosses Bandelier National Monument lands, which are administered by the National Park Service and used extensively for recreational purposes.

4.8.1 Current State

The current-state hazard-specific maps for Frijoles watershed are provided in Figures 4.8a1, 4.8a2, and 4.8a3. Conceptual site models are not included due to the very low level of hazards.

4.8.2 Risk-Based End State

Referring to the risk-based end state maps for Frijoles canyon shown in Figure 4.8b1, 4.8b2, and 4.8b3, cleanup actions will be completed to ensure that risks are acceptable under recreational-use scenarios. Portions of Frijoles canyon are expected to be returned to the National Forest Service or the National Park Service.

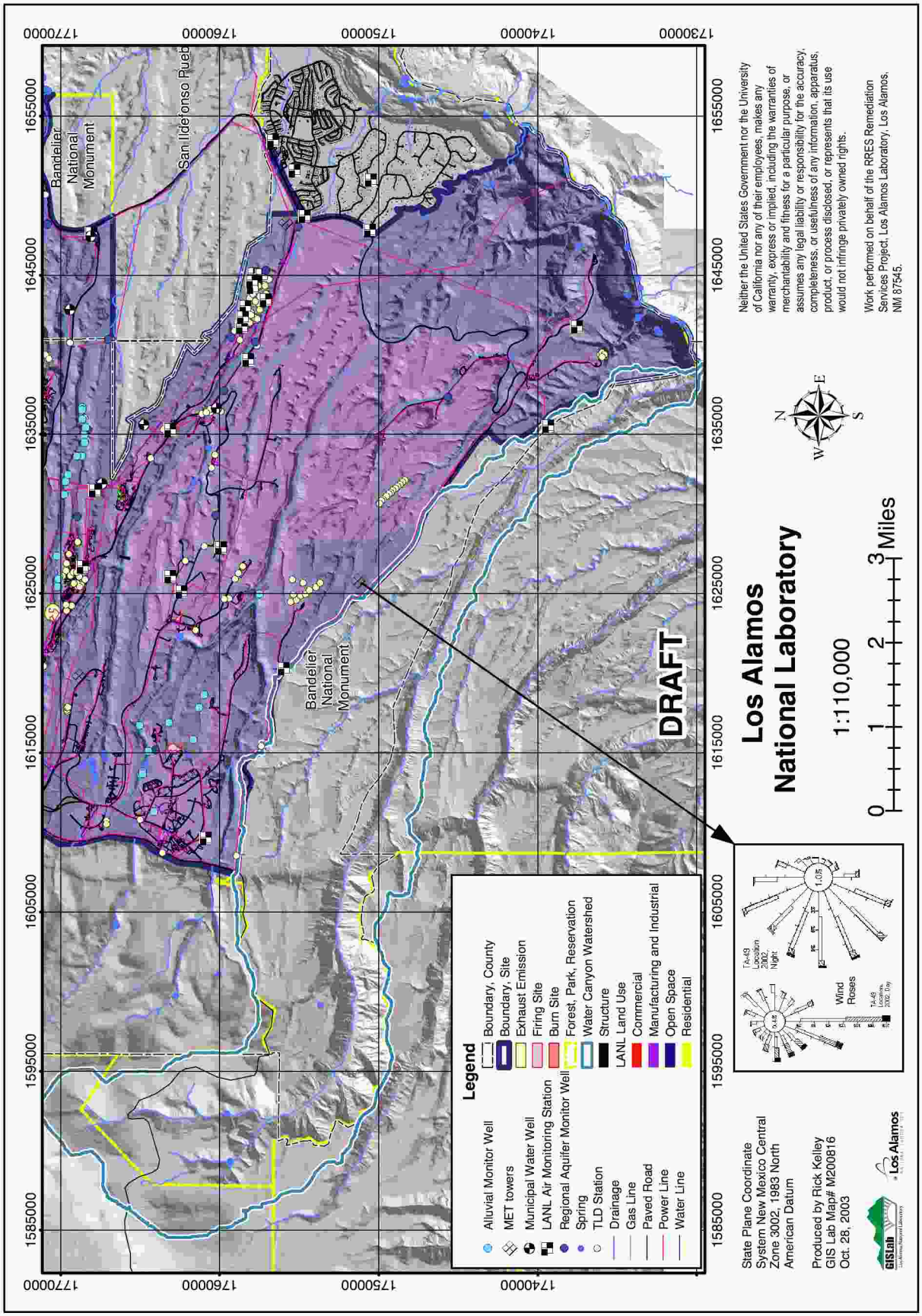

Figure 4.8a1. Hazard Area 8: Frijoles Canyon Watershed, Hazard Category A: airborne releases, Current state.

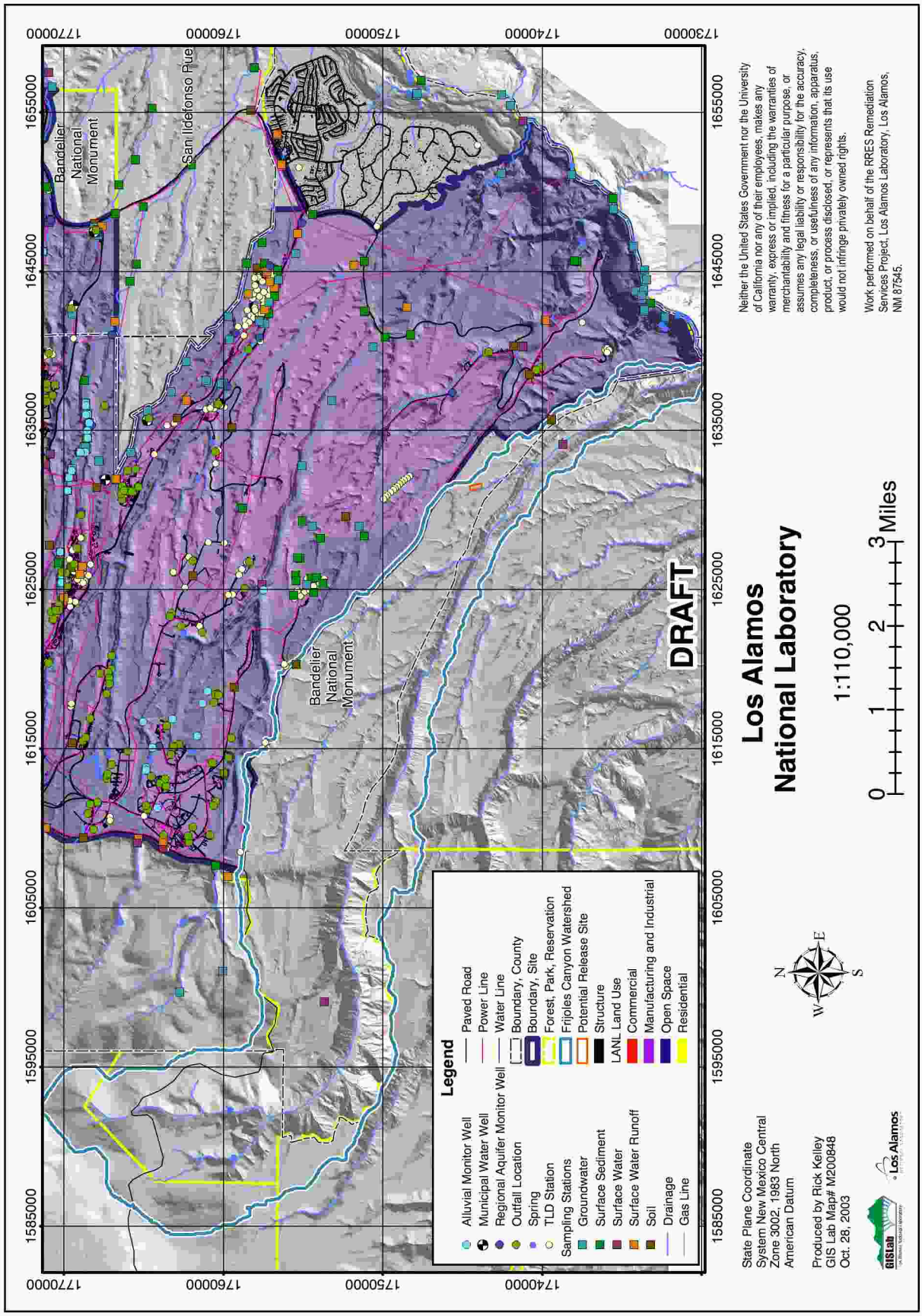

Figure 4.8a2. Hazard Area 8: Frijoles Canyon Watershed, Hazard Category B: surface releases, Current state.

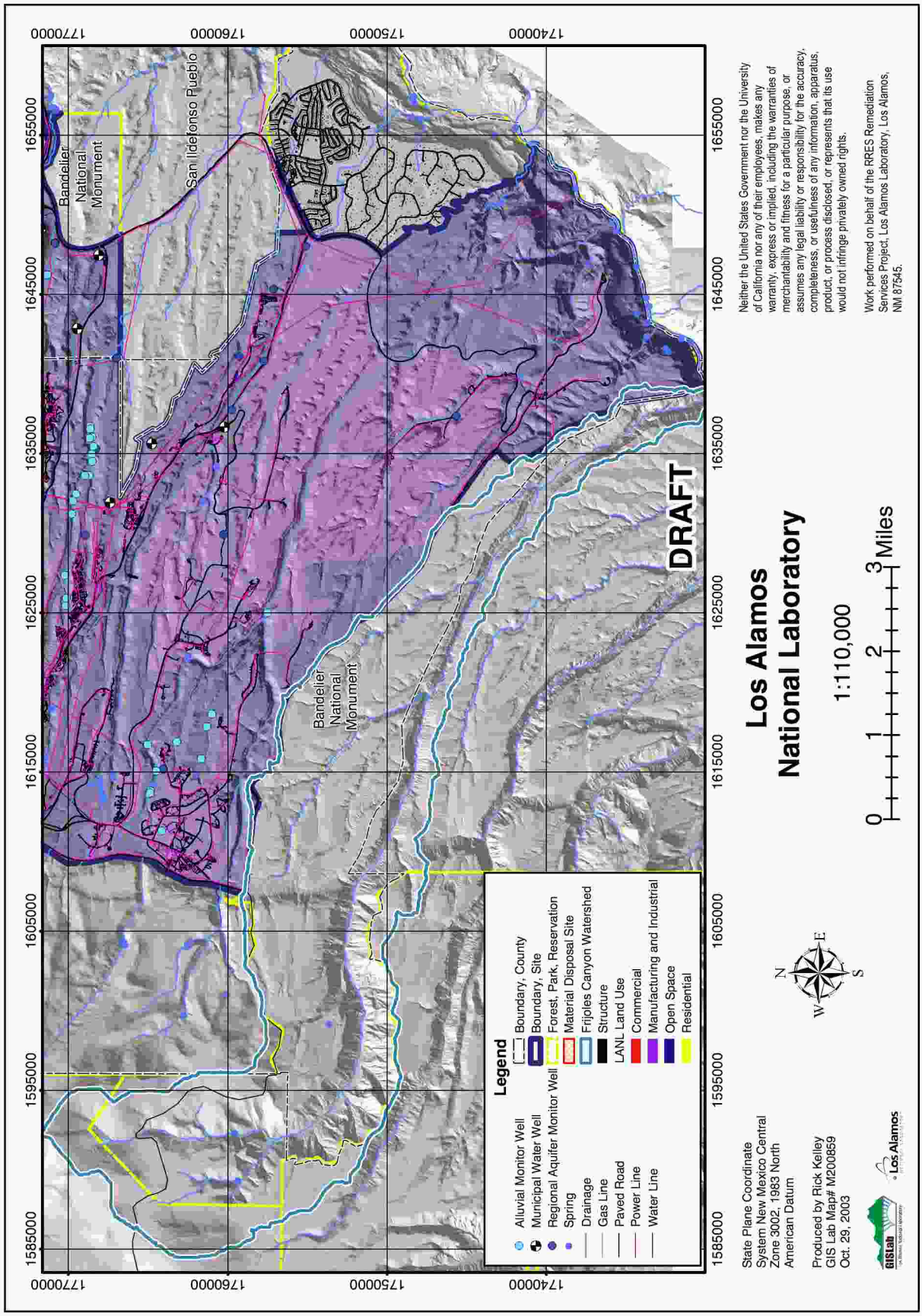

Figure 4.8a3. Hazard Area 8: Frijoles Canyon Watershed, Hazard Category C: subsurface releases, Current state.

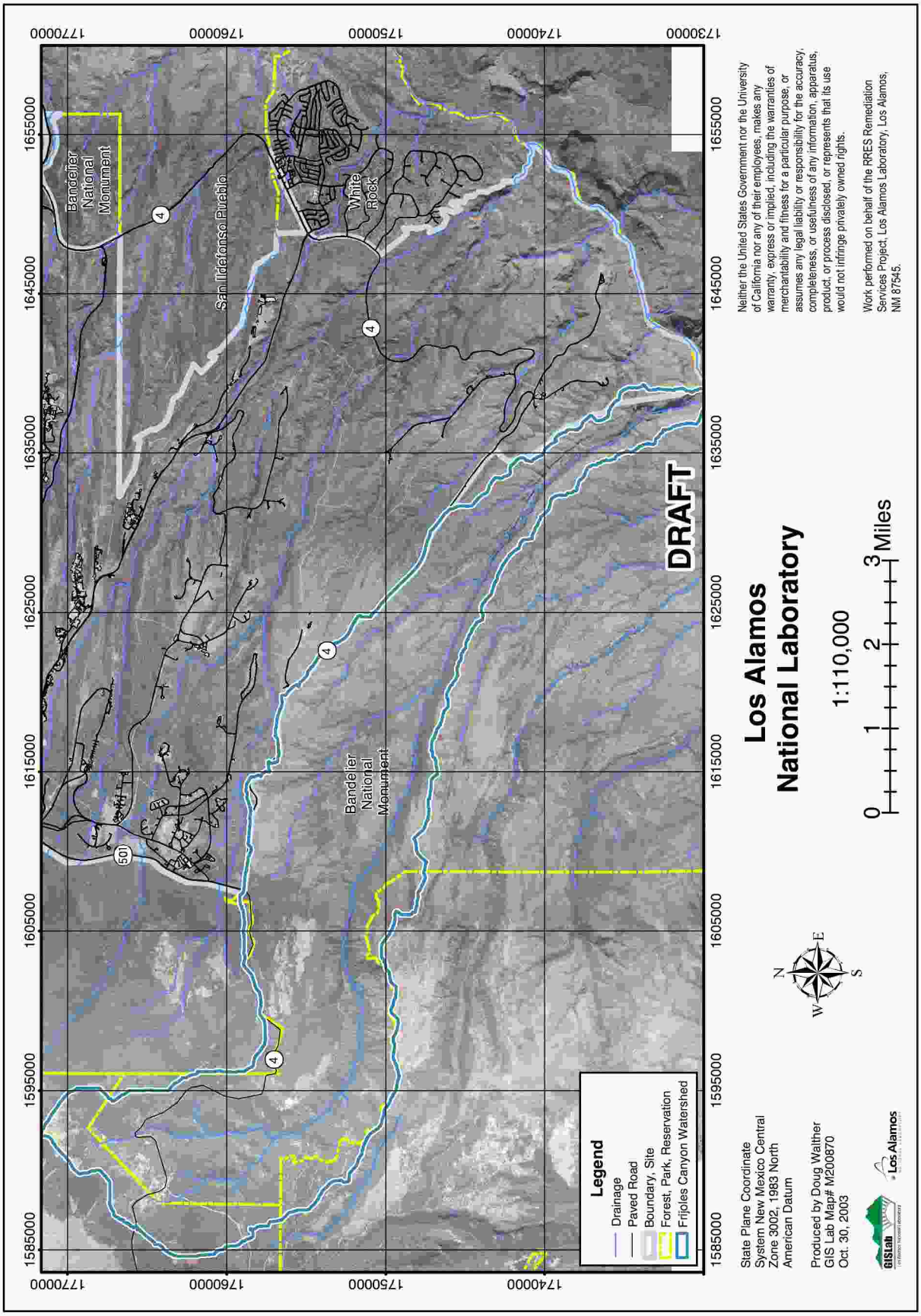

Figure 4.8a4. Hazard Area 8: Frijoles Canyon Watershed orthophoto map.

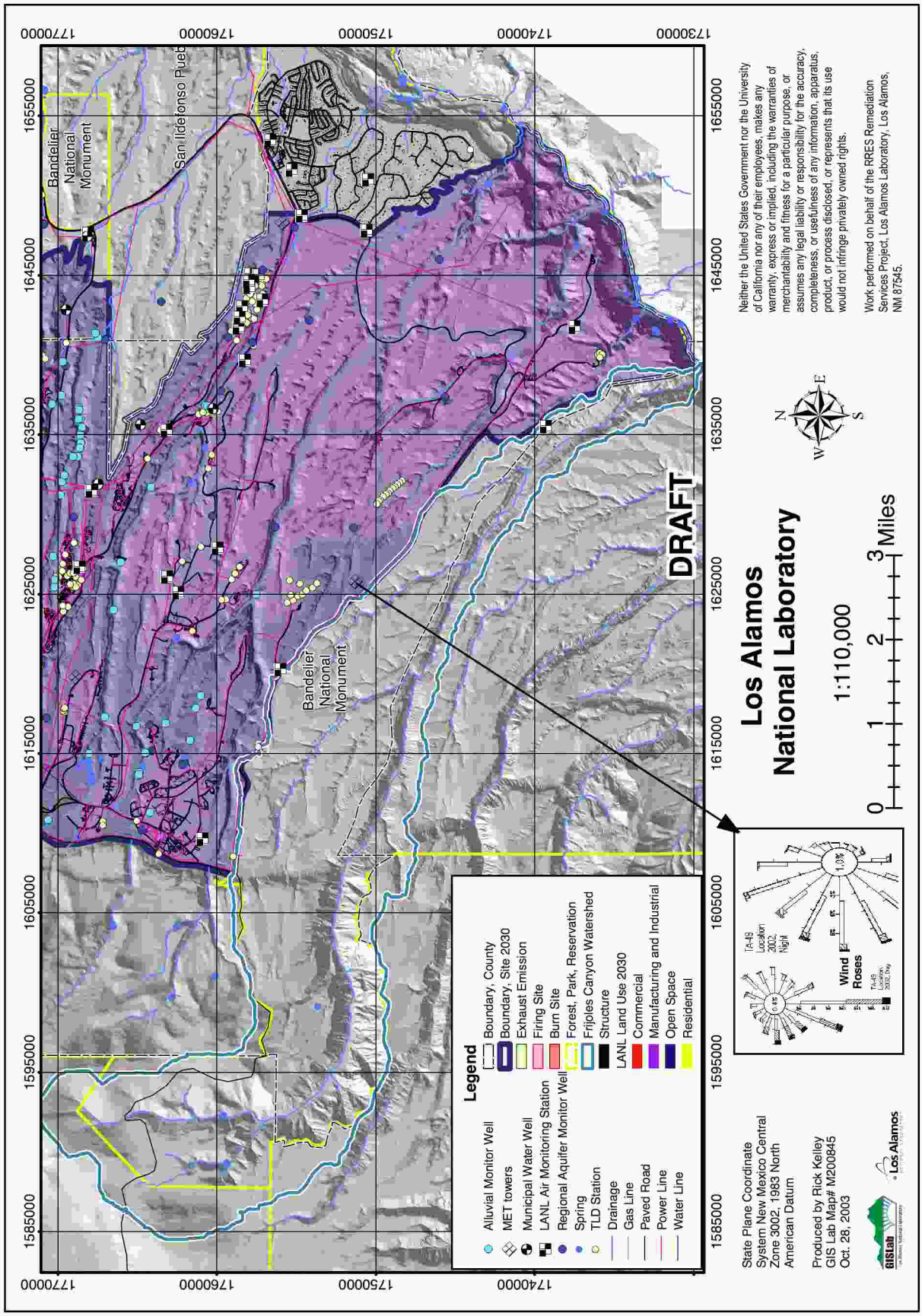

Figure 4.8b1. Hazard Area 8: Frijoles Canyon Watershed, Hazard Category A: airborne releases, End state.

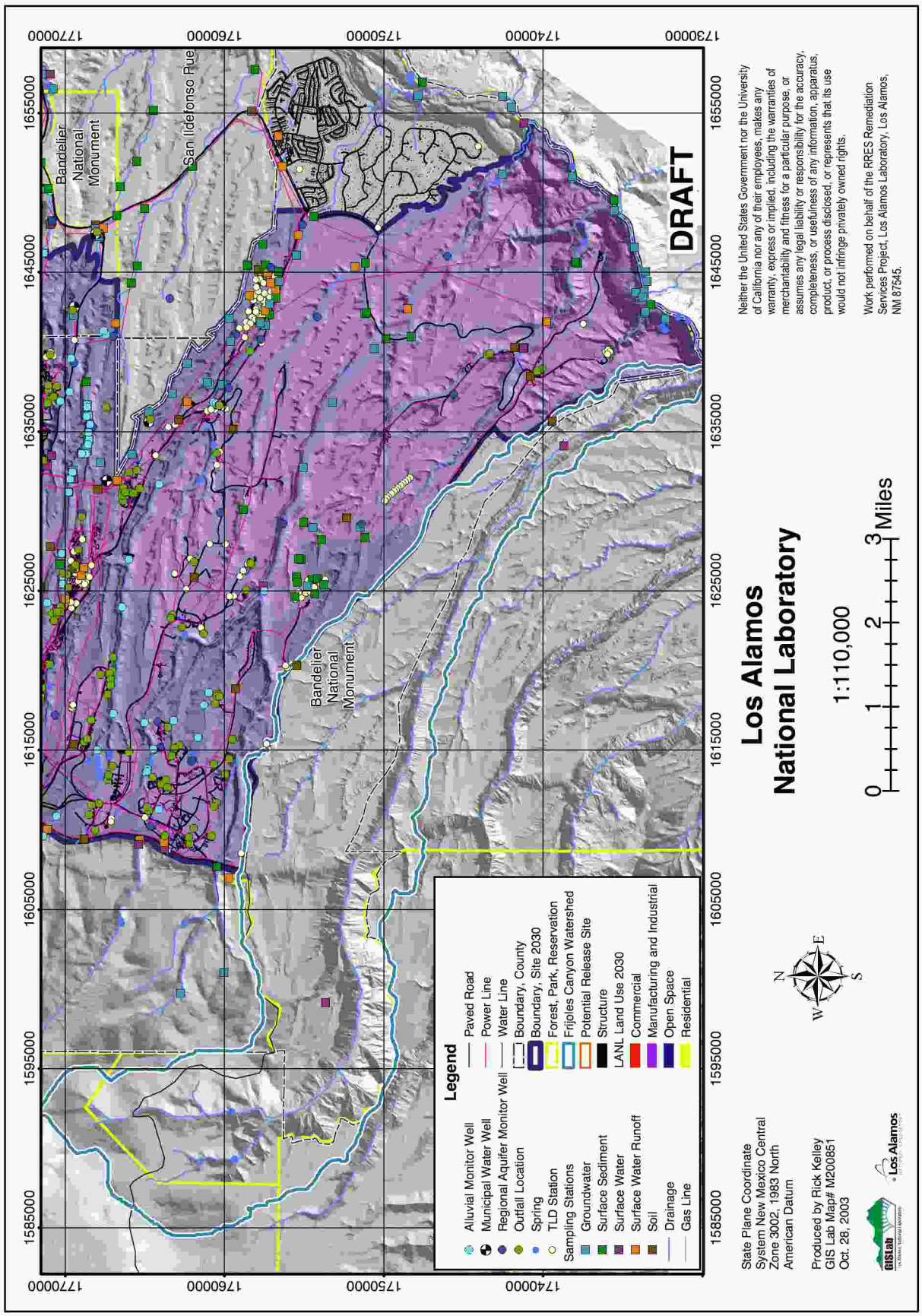

Figure 4.8b2. Hazard Area 8: Frijoles Canyon Watershed, Hazard Category B: surface releases, End state.

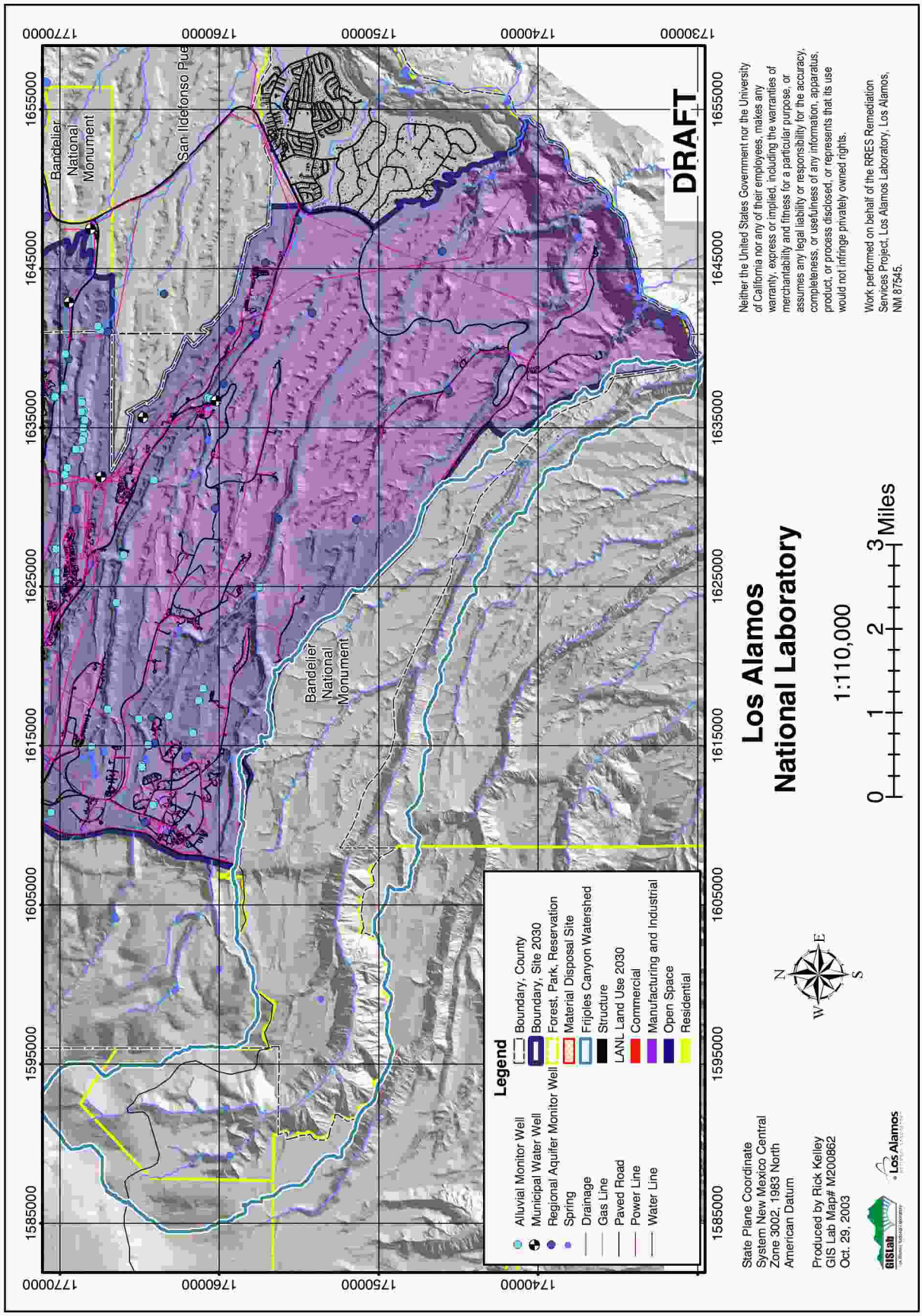

Figure 4.8b3. Hazard Area 8: Frijoles Canyon Watershed, Hazard Category C: subsurface releases, End state.